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VETERINARY MEDICINE

AUGUST CONTENTS 1949

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The dictum that young animals are endangered by mingling with adults because of the likelihood of acquiring infection, does not hold for parasitic infestation in pastures. Mature animals ingest as many parasite eggs as the young, but because of their greater resistance, they return only one-tenth as many eggs to the pasture in their feces as do the young animals.

* * * *

The fowl tick (*Argus persicus*) is the most important tick parasite of birds. Its distribution in the United States is limited to the gulf states, and to a few states to the north of these, and to California. This tick is the common vector of fowl spirochetosis in areas where the disease exists. Since this disease is now known to exist in the United States, it is important that every effort be made to eradicate ticks from the poultry farms. The use of DDT at frequent intervals will aid in ridding the premises of the parasite.

* * * *

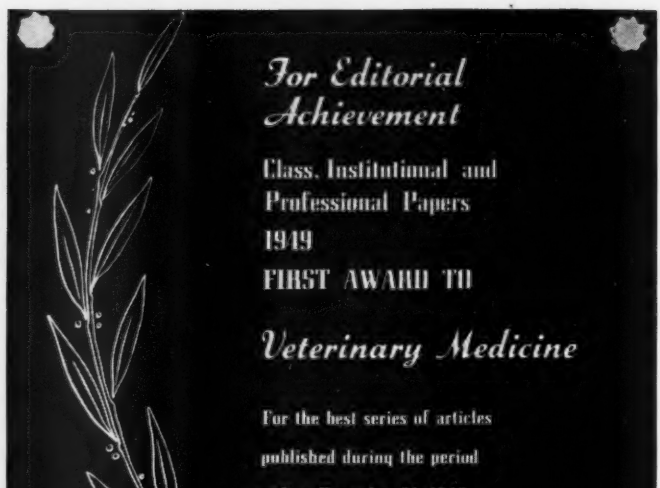
Permanent pastures perpetuate parasites was once thought to be sound doctrine. However, more study has shown that the parasite population of a pasture depends upon the regularity and liberality with which it is contaminated. Since a new pasture is likely to be stocked with more animals than an old, worn out one, it follows that it will probably be heavily seeded with parasite eggs and in a few weeks will build up a population more dangerous than that on old pastures. Parasites do not accumulate over the years on pastures grazed by infected livestock, but soon reach a level of contamination where as many die day by day as are added.

* * * *

Poultry may be protected from coccidiosis in two ways: (1) Graduate the infection to an amount just sufficient to produce slight symptoms. If this dose of organisms be continued daily for a couple of weeks the birds develop a resistance sufficient to protect them from natural infection. Because of the difficulty of graduating the dose this method is not practical for field use. (2) By exposing the chick to mass infection and at the same time incorporating a suitable sulfonamide in the mash the bird may be protected from injury by the coccidium and at the same time be enabled to develop a tolerance for the parasite.

* * * *

Measures for parasite control must be more varied than for the control of bacterial diseases. Thus one would hardly expect to eradicate coccidia by the institution of effective measures to protect some classes of animals or birds from contact with these parasites. Control of coccidiosis, therefore, may resolve itself into conditioning the host to tolerate the parasite. Contrarily, eradication of the fever tick is practical and, in measures to control bovine babesiasis, both the parasite and the host can be ignored and all effort expended upon elimination of the intermediate host. Still other parasites are suppressed by isolating the host, *e.g.* screening against malaria mosquitoes, use of insecticides, fencing off contaminated areas in pastures, etc.


For Editorial Achievement
Class, Institutional and Professional Papers
1949
FIRST AWARD TO
Veterinary Medicine
For the best series of articles published during the period ending December 31, 1948 in the eleventh annual editorial competition
Conducted by
INDUSTRIAL MARKETING

For the second time in five years VETERINARY MEDICINE has been honored at the annual meeting of the National Industrial Advertisers Association by having won the first award among class, institutional and professional magazines in *Industrial Marketing's* 11th annual Editorial Achievement Competition. In this event 529 magazines in the business trade, class and professional fields competed. Winning a silver plaque, first prize, in its class in a competition of this magnitude is an outstanding achievement for veterinary journalism. Second, third and fourth prizes in this group, all including an award of merit, were won by *Rotarian, Journal of Chemical Education,* and *New York Certified Public Accountant.* VETERINARY MEDICINE has participated in these competitions only twice—and won both times.

Equine Encephalomyelitis in 1948

The incidence of infectious equine encephalomyelitis in 1948 was lower than in any of the preceding 14 years during which statistics on the subject have been collected by the Bureau of Animal Industry, USDA. Only 1796 cases were reported to the Bureau from 35 states. Of these 553 cases occurred in August and 626 in September.

The greatest number of cases (237) occurred in South Carolina. Kansas with 207 cases was second and Oklahoma third with 172 cases. The average case mortality in the whole country was 35.5%. The total deaths numbered 638.

Incidence of Rabies in Illinois

A study of the dog bite incidence over a five-year period (1943-1947) presents some disturbing public health aspects. More than 50% of the bite wounds were inflicted on children and adolescents under 20 years of age. On approximately 70% of those reported these wounds were on the head, neck, shoulders, arms and hands or, in the so-called "danger zone," because of the nervous relationship of these areas to the central nervous system.

Rabies in Illinois is computed to have cost the livestock industry of that state approximately $500,000 in 1948.—*Ill. Dept. Pub. Hlth.*

The tangible benefits of the campaign to conquer cattle tick fever, which began in 1906, include (1) nearly 50% greater productivity of dairy cattle in previously tick-infested territories; (2) an increase in the size of dairy herds and improvement of the herds by the introduction of purebred and good grade stock; (3) an increase in the total cattle population of the South by several million; (4) organization of cow-testing associations, the erection of cheese factories and creameries, and the development of diversified agriculture, and (5) a marked increase in the value of farms that have been freed of the cattle tick.

Insect Damage and Insecticides

In 1938 the USDA estimated the parasite damage to livestock to exceed 138 million dollars annually. That was when the prices of livestock were lower and the damage done by some parasites, *e.g.* horn flies, was underrated. It is curious that a whole generation elapsed after the introduction of the lime and sulfur and arsenic dips, before further material progress was made in the development of remedies against external parasites; then in a rush came DDT, chlordane, benzene hexachloride, and others as yet less widely used parasiticides. Each of the three which are now commonly used, possesses advantages over either of the other two under certain conditions.

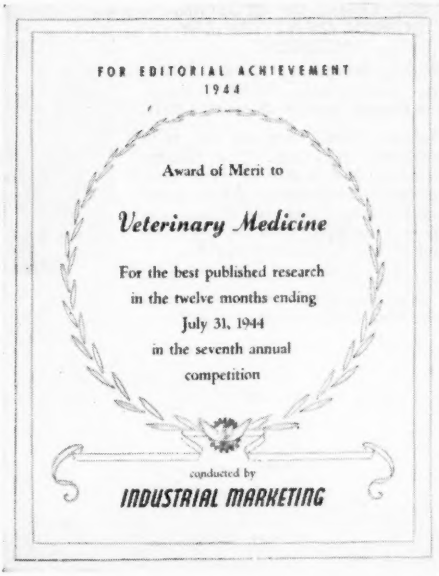
DDT, because of its toxicity to flies and its long residual action, ranks first against those insects which roost on walls and ceilings of animal shelters. It is not recommended for the interior of dairy barns, or for use on lactating cows.

Chlordane, because it is toxic to a greater variety of pests, fleas, chiggers, lice, etc., and because of its innocuousness for the hosts and lack of odor, fits it for use on animal pets, on animals soon to be slaughtered for meat and where food is prepared or stored.

Benzene hexachloride is still more toxic than either DDT or chlordane for most insect and arachnid pests and, in most instances, has sufficient residual effect to destroy larvae that may hatch from eggs which are present when the animal is sprayed (or dipped). It has the disadvantage of having a disagreeable odor, which makes it unsuitable for use on or about household pets or in chicken houses, milk houses, dairy barns, and elsewhere where food is produced or processed.

Methoxychlor, least obnoxious of the group, is the insecticide of choice for dairy barn, dairy cattle, food processing establishments, and for pets.

[1]Ann. Rept. Los Angeles County Livestock Department.



Certificate of Merit awarded VETERINARY MEDICINE in the *Industrial Marketing* seventh annual Editorial Competition at the 22nd annual meeting of the National Industrial Advertisers Association, Chicago, Sept. 21-23, 1944. Three hundred five magazines participated in this competition.

Both green and dried oleander (*Nerium oleander*) leaves are poisonous to livestock. Five cows in a herd died, the only symptom of illness shown being a tarry fetid diarrhea. The county health service[1] investigated the deaths and found them to be due to oleander leaves mixed with lawn clippings which were fed to the animals. This ornamental shrub contains three poisonous glucosides of which oleandrin is the principal one. Its action somewhat resembles that of digitalin.

The Ruminant Stomach

Although a cow's stomach is divided into four distinct compartments, three of these provide no more than one-fifth of the stomach volume. In the adult cow the stomach capacities are as follows: rumen or paunch 80%, reticulum or honeycomb 5%, omasum or manypies 7 or 8%, and the abomasum or true stomach 8 or 7%. The first three compartments are merely storage and fermentation vats. They are nonglandular and actually the ruminant stomach should always be considered as a single stomach. The veterinarian must know the size, location, and function of each compartment in order to recognize the site of ailments and institute proper treatment.

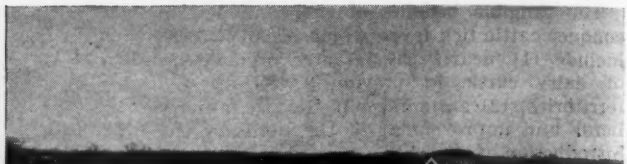
—J. D. GROSSMAN, D.V.M.

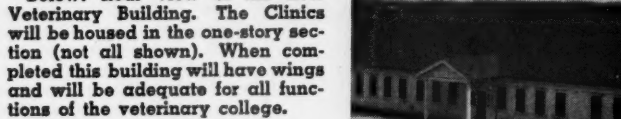
UNIVERSITY OF GEORGIA, SCHOOL OF VETERINARY MEDICINE.

Right: Temporary Clinic Buildings, foreground. Small Animal; background, Large Animal Clinic.

Below: Rear view of the new Veterinary Building. The Clinics will be housed in the one-story section (not all shown). When completed this building will have wings and will be adequate for all functions of the veterinary college.

Third building: Present quarters of the Anatomy, Histology and Pathology Departments.





FACULTY MEMBERS

Front row: Left to right, Thomas A. S. Hayes, V.S., D.V.M., Associate Professor, Veterinary Parasitology; Edward D. Stoddard, D.V.M., Associate Professor, Veterinary Anatomy and Histology; Thomas J. Jones, B.S.A., D.V.M., M.S., Ph.D., Dean; Mary R. Washburn, B.S., M.S., Ph.D., Assistant Professor, Veterinary Hygiene and Research Assistant; Clifford W. Barnes, D.V.M., Ph. D., Head, Dept. of Pathology; W. F. McLendon, D.V.M., Head, Dept. of Medicine; and J. K. MacNamee, D.V.M., M.S., Associate Professor, Pathology.

Back row: Left to right, A. B. Kamine, Ph.G., D.V.M., Associate Professor Veterinary Physiology and Pharmacology; Clifford Westerfield, B.S., M.S.A., D.V.M., Head, Dept. Anatomy and Histology; Wm. Burson, D.V.M., Assistant Professor, Veterinary Hygiene; Lois Scott, B.S., Instructor, Veterinary Anatomy and Histology; Douglas R. Burley, V.S., D.V.M., Associate Professor, Clinics and Medicine; Paul L. Piercy, D.V.M., Head, Dept. of Physiology and Pharmacology, and Claude D. Hobart, V.M.D., Professor of Veterinary Surgery.

Not in the photograph: John L. Barner, A.B., M.D., Professor of Radiology; D. F. Mullins, A.B., M.D., Acting Head, Dept. Veterinary Hygiene, and W. F. Duncan, A.B., M.A., Ph.D., Associate Professor of Botany.

The federal meat inspection services inspected 86,544,429 food animals during 1948. Of these 8,053 were condemned on ante-mortem and 314,486 on post-mortem inspection.

Veterinary Journal Changes Name

"Hemera Zoa" (domestic animals) is the new name taken by the *Nederlands-Indische Bladen voor Diergeneeskunde.* It is stated the change is made because all persons working in the field of animal science—animal husbandry, hygiene, veterinary medicine, etc.—have united in a single association. The magazine will be printed in both Dutch and Indonesian languages, with summaries in English and French.

It may be pointed out that veterinary science, a broader term than veterinary medicine, includes animal husbandry, hygiene, genetics, etc.; in fact, is animal science. When veterinary schools were first established they included a department of animal husbandry as a matter of course. This subject was not taught in agricultural or other schools until much later.

Although it is not so stated, it seems a reasonable surmise that there were political reasons for the change.

Federalized Medicine

The American people enjoy a state of health unequalled in the world today. Measures of the quality of our medical service may be seen in vital statistics. Among these measures is the record of mothers lost in childbirth. For 16 years, the United States has been among the leading nations of the world in the matter of low maternal and infant mortality. This, notwithstanding our varying climates, mixtures of races and sparsely settled sections of country, where facilities are often meager. Unhampered, the family physician, the specialist, and the surgeon have made notable progress in conquering obstacles to physical well being. Why then, impress a federalized system of medical care which will add to our tax burden? Some sizable percentage of the cost would necessarily go, not for medical service, but for administration expense.

Veterinarians are interested in this matter, not only as patients and taxpayers, but also because this socialistic trend might easily be extended to veterinary practice. The trend should warn us of the possible invasion of our field, by meddling, uninformed, political appointees. The practice of veterinary medicine and disease control in livestock will be better handled by trained men who devote a lifetime effort in this direction to the benefit of our complex society.

Preliminary tests by research workers in the USDA indicate that banana skins contain two antibiotic substances, one active against fungi, the other against bacteria. Other preliminary tests indicate that sweet potato skins contain an antibiotic substance.

In an experiment to determine the value of arsenosophenylbutyric acid in the treatment of surra, Mace, Ott and Cortez, Army Veterinary Corps, injected the drug intravenously in rats and dogs that had been artificially infected with *Trypanosoma evansi.* Only when doses approaching closely the lethal level were given was any curative effect observed.

A.V.M.A. Membership Passes 10,000 Mark

Membership in the American Veterinary Medical Association passed the 10,000 mark this June for the first time in the association's history. This means that the A.V.M.A. now has the active support of two out of every three veterinarians in the United States.

A national organization of 10,000 active members, representing every branch of the profession in all parts of North America, has been visualized by veterinary medical leaders for nearly a half century and has been considered essential to proper recognition of veterinarians in national affairs.

Secretary Hardenbergh said that this steadily increasing support has permitted the A.V.M.A. to expand its interorganization activities and its services to members, and that "growth to 15,000 by 1960 is believed to be the logical goal."

Nutrition in Disease

The sum of the processes by which an animal takes in, digests and absorbs food substances for normal metabolism, growth, work, reproduction and lactation is referred to as nutrition.

Significant disorders of nutrition as it refers to our farm animals, according to Munro and Lall, Nutritional Pathology, *The Indian Vet. Journal* 25:239-249, may be discussed in a general manner under three classifications: (1) Undernutrition.—This term signifies a general state of ill-health because of habitual underfeeding. (2) Malnutrition.—In this, the body is undernourished owing to an insufficiency of food, the wrong sort of food, or the food consumed is not absorbed due to digestive disorders associated with some diseases. (3) Dietary deficiency diseases.—These are a group of diseases that, due to a lack of some substance in the food, manifest themselves as defects of one sort or another.

KSC Alumni Honor Dean Dykstra

Dr. R. R. Dykstra, Dean Emeritus and Professor of Veterinary Surgery, School of Veterinary Medicine, Kansas State College, Manhattan, was honored at ceremonies following the banquet at the 11th Annual Conference for Veterinarians at the school, June 9 and 10, 1949.

During Doctor Dykstra's 37-year tenure as

Left to right—Milton B. Eisenhower, President; Dr. R. R. Dykstra, Dean Emeritus, Kansas State College, and Dr. E. F. Kubin, McPherson, Kansas.

Dean of the Kansas school, 1135 students were graduated in veterinary medicine. Alumni everywhere have contributed over $4,000.00 to a fund, started a year ago, to set up the R. R. Dykstra Student Loan Fund. A check for this amount was presented to President Milton Eisenhower by Dr. C. W. Bower, Topeka, Kansas, as an initial installment of this fund, which will be available for loan to veterinary students at the Kansas school. Dr. E. F. Kubin, KSC'09, McPherson, Kansas, the oldest KSC alumnus in the state, presented a watch to Dean Dykstra as a token of the esteem in which he is held by the Kansas alumni.

Although several fine breeds of light horses have been developed in the United States, this country originated no breed of draft horses. The closest it came to developing such a breed was the Conestoga horse that the advent of the railroad "nipped in the bud."

If when an Arab leads his horse into water not above the coronary band, the animal is able to drink without bending either knee, he is considered to be of perfect conformation. If the horse can accomplish this feat mounted —you guessed it. Superperfect!

According to Wall (The Vertebrate Eye) the two eyes of a bird often outweigh its brain.

Medical Licensee Statistics

In the 14 years, 1935 to 1948, inclusive, a total of 143,684 licenses to practice medicine were issued by the various states. Of these, 88,097 were issued as a result of examination and 55,587 by endorsement of credentials. Fewer than 10,000 licenses were issued in any year prior to 1946. In that year, the number was 16,236; in 1947, it was 14,443 and in 1948, 13,551. Of the 6,560 who were examined in 1948, 3.3% of those from the U.S. approved medical schools failed. From approved schools in Canada, 16.5% failed; from extinct schools, 6.7% failed; from foreign schools, 51.5% failed; from unapproved schools in the U.S. 42.7% failed, and from schools of osteopathy, 37.8% failed. Of the total number examined 94.8% were from A.M.A. approved schools. There were no failures among the graduates of 19 of the 68 approved schools in the United States. Northwestern University was represented in the examinations by the largest number of graduates—98 in Illinois and 116 in 27 other states. No physician has applied for a license in Wyoming in the past five years.

The Mystery of Olfaction

Speaking of the sense of smell, a physiologist with a flair for humor once said that the celebrated radar instruments of aerial navigation were as crude as a corn husker compared with the mechanism of olfaction which enables a dog to follow the trail of another animal unerringly, in the right direction, even though the trail had been crossed and crisscrossed by fresher tracks of kindred or sundry species. A Bloodhound takes a whiff at a garment and then follows the former wearer along beaten paths, traveled highways, field, swamps and crowds of people to the fugitive's hideout beyond. The ability to apprehend a particular odor blended with a maze of other odors of identical source is a baffling biological function, the explanation for which awaits refinement of the human mind. No less baffling is the nature of the substance radiating from an animal's footsteps to the tracker's nose.

Yale scientists,[1] experimenting on the mystery of olfaction, come up with the theory that infrared rays (of all things unexpected) are involved. The antennial reactions of certain insects artificially deprived of infrared rays differed with the various odors to which they were exposed. The details must be sought in science literature.

[1] Gaines Dog Research Bulletin, Winter, 1948-1949.

The horse is on the way out. Geologically speaking, he will disappear in a short time, according to Professor Sloss, Northwestern University, who has studied the history of the horse and horse-like animals as revealed in fossils. He has plotted the increase from a few to many species and then the dwindling number until there are only four or five left. Continuing his downward curve to the point of extinction he finds the equine genus has only 15 to 20 millions years left before it goes the way of countless other animals that have waxed, waned and disappeared.

* * * *

Immunity implies a greater than normal resistance to disease. The factors responsible for the immunity must reside in immune animal. They are usually thought of as being constitutional, but this belief is based on tradition rather than knowledge. Antibodies and immunity may coincide, but such is not always the case. Sometimes antibodies are numerous after vaccination but immunity lacking; again antibodies may be numerous in one individual and scarce in another, yet both possess a solid immunity. The statement that immunity is caused by antibodies lacks substantiation. The mechanism of immunity is unknown.

* * * *

Complexity of Factors Which Affect Reproduction

To the livestock breeder of today, sterility or reproductive failure among his herds and flocks is of great economic importance and no extensive breeder of livestock has escaped its effects. Infertility and low fertility are usually regarded as caused by infectious agents inducing abnormal function of the reproductive organs of male and female. In a number of cases, this is undoubtedly correct, although often the cause of decreased fertility, and many times complete sterility, is improper nutrition. Investigators for years have been trying to find the causes for infertility and aberrations in the reproductive system. In many cases they have substantiated the fact that reproductive abnormalities could be traced to pathological conditions which resulted from infection, genetic factors, malnutrition or their combinations. The etiology of sterility represents, therefore, a most complex problem and the solution of the subject is not to be found in any one aspect. All etiological factors which have been cited must receive due consideration in an attempted diagnosis of the subject of sterility. —G. K. UNDERBJERG, in *Vet. Sci. News.*

Rabies Statistics for 1948 Revised

In the July issue of this magazine, page 281, rabies statistics for 1948, collected by the Federal Bureau of Animal Industry, were reported. The Bureau has since issued a supplementary report because of an error in the number of cases listed for Indiana.

The number of cases reported for Indiana should be 788 and not 1755 as stated in the earlier report. This alteration reduces the total cases reported from all the states to 8508, and the total in dogs to 6610, in cattle to 599, in horses to 34, in sheep to 14, in swine to 36, in cats to 378, in miscellaneous animals to 819, and in man to 13. It also puts Texas with 1035 cases at the head of the undesirable list with respect to rabies.

* * * *

Veterinary Affairs In Occupied Japan

The monthly report of the Veterinary Affairs Division of the Military Government of Japan often contains items of general interest. From a recent report it is noted 1200 veterinary students were examined for graduation in March 1949. The board of examiners is independent of the colleges and the subjects in which applicants for graduation (and license) were examined, included: anatomy, histology, pathology, physiology, bacteriology and immunology, surgery (both practical and general) and obstetrics, internal medicine, diagnosis, therapeutics and pharmacology, hygiene and zootechnics, disease control, meat and milk hygiene, and feeding and breeding problems.

The milk hygiene section inspected more than 10,000 dairy farms and examined nearly 25 thousand samples of milk in December 1948. Milk plant inspections numbered 3708. The quantity of milk produced was: special milk (raw), 31,292 liters; goat milk, 358,362 liters; ordinary milk, 15,015,485 liters of which approximately one-third was pasteurized and the remainder sterilized.

Meat inspection included ante-mortem and post-morten inspection of 67,803 animals, cattle, 28,939; calves, 1118; horses, 7125; swine, 30,325; sheep, 35, and goats 264. Meat processing plants inspected numbered 282 and retail meat markets more than 8000. The seafood inspected was more than 30 times the amount of meat—one-quarter billion pounds.

Cases of swine erysipelas outnumbered the cases of all other diseases of swine combined. There were 37 cases of equine anemia in December and 48 in January. Bovine tuberculosis (acute clinical) was first in the number of cases among diseases of cattle, and pullorum disease (11,779 cases during the month) was first among poultry diseases.

Mineralized Salt in Diet of Livestock

Because mineral elements are essential constituents of all animal tissues and play important parts, they are necessary for the maintenance of health, growth, and reproduction. Since no mineral elements are produced in the digestive process of livestock and poultry, those that are needed must be supplied by the feed or by suitable mineral supplements.

It now is known that the feed of our livestock and poultry does not always supply enough of the several mineral elements making for health and good digestion. In fact, virtually all feedstuffs are partially deficient in sodium and chlorine, the mineral elements of which salt is composed. For this reason, it has been an age-old practice to supply salt to all animals, either mixed with the feed or in the form of a "salt lick." In many localities the soil is deficient in one or more mineral elements and grains and forage crops grown on such soil are also deficient. There are extensive areas in which the soil—hence the crops—are deficient in calcium, phosphorus, iodine, manganese, cobalt, iron or copper, in several of these mineral elements.

In general, none of the grains or other common seeds contains enough calcium to supply the need of an animal for that element. Iron and copper are needed too to help prevent anemia. The unfavorable results of mineral deficiencies have been observed in many parts of the world. Cobalt deficiency, for example, either in sheep or in cattle, has been observed in the United States and in other parts of the world. Cobalt deficiency, which results in stunted growth, is probably more widespread than is realized.

Often the symptoms of mineral deficiency in animals are general rather than specific. That is to say, the symptoms may be a retardation of growth, poor condition, rough coat, or poor fertility. This is because a deficiency of any one of the essential mineral elements adversely affects the general health of an animal. Usually, the severity of the symptoms depends on the degree of deficiency. A slight deficiency may have an effect that is scarcely noticeable, but a very marked deficiency always results in poor health, and finally in death.

There are a few instances, however, in which the symptoms of mineral deficiency are more or less specific. In other words, there are cases in which one can be reasonably sure from the symptoms just what mineral element is lacking. For example, goiter in animals is nearly always the result of a deficiency of iodine; and perosis in chickens is nearly always the result of a deficiency of manganese.

But because the symptoms of mineral deficiency are, for the most part, general rather than specific, it is good practice to supply animals with a salt that contains traces of the needed minerals so they get them regularly, and this can easily be done with the use of trace mineralized salt instead of plain salt. Stock gains are faster, animals healthier and young more vigorous.—E. B. JUSTIN, JR.

* * * *

Growing potato plants were sprayed with benzene hexachloride. The potatoes when cooked, had a bitter taste. The potatoes were then fed to a cow at the rate of 20 pounds daily. Immediately the milk developed a pronounced bitter taste. This cow-feeding experiment was conducted at the University of Massachusetts.

* * * *

Southern Byproducts Dairy Feed Produces Milk Efficiently

A concentrate dairy mixture, made up entirely of byproducts from southern crops, produced as much milk and cost less than a standard mixture containing 70% of grains according to a report of the USDA.

In two feeding experiments, one at the Dairy Field Experiment Station, Lewisburg, Tenn., and the other at the Coastal Plains Station, Willard, N. C., a concentrate byproducts mixture consisting of 375 pounds each of dried citrus pulp and dehydrated sweetpotatoes and 125 pounds each of peanut meal and cottonseed meal was compared with a standard grain mixture of 400 pounds of corn meal, 300 pounds of ground oats, 200 pounds of wheat bran, and 100 pounds of cottonseed meal.

Good quality alfalfa hay was fed with both mixtures at Lewisburg. At Willard the roughage consisted of corn silage and alfalfa hay.

Combined results from the experiments show that the average production of the 18 Jersey cows when fed on the byproduct mixture was 22.8 pounds of 4% milk per cow per day. They averaged 22.7 pounds when fed the grain mixture.

Total feed cost, including roughage, per 100 pounds of 4% milk was $2.72 for the experimental ration and $3.15 for the grain ration at Willard; and it was $3.05 for the experimental ration and $3.40 for the grain ration at Lewisburg. Thus, there was a saving on the experimental ration of 43 cents per 100 pounds of milk at Willard and 35 cents per 100 pounds of milk at Lewisburg.

The results of these dairy feeding experiments emphaize the desirability of increasing the production of southern agricultural byproducts and also their use in concentrate mixtures for dairy cattle.

Notes on Veterinary Parasitology

By A. O. FOSTER, B.A., M.A., Sc.D., Beltsville, Maryland

Cattle Fever Ticks and DDT-BHC Dips

For many years, the arsenical dip has been officially recognized for the destruction of fever ticks. Recent experimentation[4] with the chlorinated hydrocarbon insecticides may warrant some revision of this position. Many formulations were extensively tested in northern Mexico just prior to the outbreak of foot-and-mouth disease in that country. Up to that time, from 400,000 to 800,000 head of cattle were imported annually into the United States from Mexico, and it had been apparent that there might be a place for another dip than arsenic if one were found that possessed at least the equivalent in essential properties, especially if it provided a sufficiently longer residual protection against ticks to assure the arrival of tick-free animals from the tick-infested herds below the border. The tests indicated that dips containing BHC (benzene hexachloride) and DDT, in combination, fulfill this important requirement and, in fact, are superior in every respect to the standard arsenical dip. There is, of course, a wide field of potential application of this dip in the cattle raising areas of the world. It may help solve the critical food problem by improving the control of tick-borne diseases. Moreover, the new dip is not only a better acaricidal remedy than the arsenical dip, but it is efficacious against the troublesome arsenic-resistant ticks.

Although dips containing many combinations of the aforementioned chemicals were efficacious, the best appears to be one containing 0.25% BHC (13% gamma) and 0.50% DDT; the amount of the latter being arbitrarily increased beyond that shown to be necessary experimentally in order to assure adequate residual protection. Such a dip may be prepared by using eight pounds of wettable 50% DDT and four pounds of wettable 50% BHC, containing approximately 6% gamma isomer for each gallon of suspension.

A chief requisite of official dips is a vat-side test for readily determining the strength of the mixtures. It is certainly only a matter of time before such a test will be developed for the DDT-BHC dip. It is also probable that standardized, concentrated preparations will soon become commercially available.

[4]Cobbett, N. G., *Am. Jour. Vet. Res.* 8:280-283. 1947 and 9:270-276. 1948.

Milk Cows and DDT Substitute

A release from the USDA dated March 24, 1949, is of utmost concern to dairymen, cattlemen, and veterinarians. It states that DDT should not be used on dairy cows. The decision was not prompted by instances of injury to human health but, rather, by the fact that the presence of DDT in milk is contrary to the Food, Drug, and Cosmetic Act. Inasmuch as use of the chemical for fly control in cow barns and dairies, or for pest control on feeds for milk cows, carries the risk of permitting small amounts of it to appear in the milk, these uses of DDT, as well as its direct application to milk cows, are inadvisable.

In lieu of DDT, the release recommends methoxychlor, pyrethrum plus piperonyl butoxide, and the organic thiocyanate compounds. Methoxychlor is comparable to DDT in efficacy, uses, and methods of application. It is, however, of lower toxicity to mammals and does not appear to be excreted in significant amounts in the milk of cows exposed to it. Usually, it is employed as a 0.5% water-base spray on dairy cattle or as a 2.5% water or oil residual spray in dairy barns and wherever milk is handled. Pyrethrum is efficacious against many pests of cattle, and its efficacy is enhanced by combination with certain other chemicals including piperonyl butoxide. Such mixtures should be used in accordance with directions on the labeling of products containing them. They are not only useful for application to the animals but also as space sprays in barns and dairies. The thiocyanates are chiefly useful as space sprays.

Farmers are urged to reduce fly breeding sources by proper clean-up and other sanitary measures. It is also suggested that this be supplemented by the use of residual sprays, which may include DDT, in and around buildings where dairy animals are not housed and on fences and other places where flies congregate.

Up-to-date information on the use of the newer insecticides in the control of external parasites of livestock is found in Circular E-762 (Revised) of the Bureau of Entomology and Plant Quarantine. Other formulations of particular value for controlling lice on dairy cattle are described in USDA Farmers' Bulletin No. 909. They may be obtained from the Superintendent of Documents, Washington 25, D. C.

Veterinary Problems in Poultry Production

By W. R. HINSHAW, D.V.M., Ph.D., Davis, California

The ostrich is the only bird which, under normal conditions of rearing, is suscepible to anthrax, although sporadic cases have been reported in ducks and in birds in zoological gardens. Such cases have usually followed the feeding of large amounts of meat from carcasses of anthrax infected animals.

"Sour" eggs also called "fishy," "cheesy" and "cabbage-water" eggs are caused by a species of the bacterial genus Pseudomonas according to a report by Lorenz and Starr (*Nulaid News* 26:3, Jan. 1949). These eggs have an unpleasant odor, the yolk often looks as if it were partially cooked, the albumin is liquified and may be stringy. The source of the Pseudomonas is the soil and dirty eggs are most often affected. The organism penetrates the shell and it takes several days to produce the typical sour condition. Therefore, sour eggs are usually not discovered by early candling, but are found after a period of storage. All eggs that have ever been dirtied must be considered potential sour eggs, according to the authors, and should be kept out of storage. Dirty eggs which have been washed should not be mixed with clean eggs during storage.

Stilbestrol Improves Flesh Quality in Cockerels

At the Massachusetts experiment station trials on the use of diethylstilbestrol have been in progress since 1943. Vondell, *Featheredfax* (Jan. 1949). In their experiments, six to 10 week old males were implanted with one 15mg pellet. In 10 to 14 days the following symptoms are noticed: wilting of the comb and yellowness on the face; a lazy attitude; a depressed sex activity which lasts for five weeks. When the birds were confined by themselves the depressing effect lasted for eight weeks. No loss of appetite was noted but there was no increase in weight when the treated birds were compared with untreated ones. The flesh quality of treated birds was, however, vastly superior. There was no gain in the feed-per-pound weight ratio, so the only benefit from the treatment was an improved flesh quality.

When old males were given the diethylstibestrol pellets, fat gains and a tenderizing of the flesh occurred in the five weeks following treatment. The good effects of hormone pellets vary, according to Vondell,, with the kind of birds and with the environment. For best results the males should be confined. The pellets will not prevent fighting nor mating. Anything which stirs the male instinct tends to nullify the effect of the hormone.

The effects of a single pellet usually lasts for five weeks after which the red returns to the face and by the end of eight weeks, sexual activity is usually resumed.

There are very few references in the literature to accurate figures on water consumption of birds, so the report of Morehouse (*Poultry Science*, 28:152, 1949) on the amount of water consumed by turkeys will be welcomed by investigators. He presents a table of mean daily and weekly consumption data for turkeys from one to 26 weeks of age. According to his data, 100 week-old poults will drink 8.34 gallons of water in one week. By the time they are three weeks old, the consumption is increased to 17.56 gallons per week, and at 12 weeks 93.9 gallons will be needed for 100 birds. From 13 to 26 weeks, the consumption ranged from 100 to 125 gallons per week. These data were collected at the Iowa Station, beginning in April and continuing until the birds reached 26 weeks of age.

A new worry for the public health authorities as well as for the poultryman and the veterinarian may be Newcastle disease. A number of reports of conjunctivitis in laboratory workers and kitchen workers handling poultry have been traced to this virus. The possibility of the Newcastle virus causing more acute symptoms in man is shown in studies reported by Howitt, Bishop, and Kissling (*Am. J. Pub. Hlth.*, 38:1263,1948). In a study of human cases, involving both children and adults, in three southern states, adults manifested influenza-like symptoms, while children showed some poliomyelitis-like symptoms, or in some instances symptoms of meningitis. Rapid recovery without paralysis or other after effects followed the sudden onset and febrile course. Antibodies for the Newcastle virus were detected in the blood serum of recovered individuals. The authors suggested that the virus of the disease has probably spread from fowls to man and then from man to man. In some of the cases reported the patients had a definite history of contact with chickens suffering from the disease.

In ultraviolet-light a fresh egg glows scarlet and an old egg purple.—*Hatchery and Feed.*

Sulfamerazine and sulfamethazine, properly employed, will prevent loss from cecal coccidiosis; sulfaquinoxaline is an effective preventative and treatment for both cecal and intestinal coccidosis and also for fowl cholera.

The Economic Losses from Coccidiosis Are Enormous

Coccidiosis is the most omnipresent of the specific diseases of farm animals, affecting all but the equine species. It is the major hazard of poultry and the cause of serious losses among calves and lambs. The economic losses from mortality, loss of condition, stunted growth, and lowered production are enormous, but no one knows, even approximately, how great. Indirect losses, such as lowered resistance to other diseases and interference with breeding programs, are among the almost completely unknowns.

Sub-acute coccidiosis in a four-week-old Single Comb White Leghorn chick.

During the past two years, Seeger of the University of Delaware, tested 36 preparations for efficacy in the prevention and treatment of cecal coccidiosis in chickens. Seven drugs were determined to be highly effective as cures. They were: sulfamethazine, sulfamerazine, sulfaguanidine, chlorosulfadiazine, sulfaquinoxaline, sulfapyrizine, and nitrophenide. Two drugs—N1 benzosulfanilamide and sulfanilamidophenylarsenoxide were effective only as preventatives. The remaining 27 alleged remedies, most of them favorite prescriptions of broiler raisers, were but slightly effective or wholly ineffective.

Tomhave of the University of Delaware conducted an experiment to determine the effect of moisture in the litter on losses from coccidiosis. The result: The loss was 1.83% on litter containing 14.3% moisture; 3.61% on litter containing 36.2% moisture; and 6.59% on litter containing 50.3% moisture.

Sulfonamides in Poultry Medicine

Sulfa drugs have no value in combatting virus diseases of chickens. The usefulness of sulfonamides in treating respiratory infections of poultry is confined to two bacterial diseases —infectious coryza and fowl cholera. Even in these diseases control depends on selection of the proper drug from among the several sulfa compounds now available.—J. P. DELAPLANE, D.V.M.

Iodine Treatment for Coryza

Severe and persistent outbreaks of fowl coryza on five large poultry farms, involving 25,000 birds in all, were treated with rapid and marked success by iodizing the birds' drinking water to a concentration of one part of "free" iodine in 20,000 parts of water (achieved by adding one teaspoonful of Lugol's solution to every gallon of water) and by disinfecting the air of batteries and coolers by means of iodine vapor. Indications that iodized water alone is sufficient to effect a cure are being further investigated.—W. M. MCKAY in *Vet. J.* 104:70-74. 1948. Author's Summary.

Pseudomonas Infection in Poults

An infection among turkey poults causing 80% mortality is reported in which the etiological factor was determined to be *Pseudomonas aeruginosa.* The infection resembled pullorum and paratyphoid infection. The outbreak occurred on a farm where no other poultry had been kept for years, and in new brooder houses. Management practices and feeding methods gave no clue to the cause, yet the disease appeared to be due to ingestion.

Primary symptoms included a staggering gait and drooping wing. A brown, foamy diarrhea was manifest. Death was sudden. The usual post-mortem lesions were excessive fluids in the abdominal cavity, gelatinous exudate under the skin, pale liver, and inflammation of the intestines with some petechial hemorrhages.

Vitamin A deficiency is suspected of being a predisposing cause of infection. Strict sanitation is recommended for control.—CHUTE, H. L. *Can. Jour. Comp. Med.,* 13:112-115 (May), 1949.

Diagnosis of Virus Infection*

In general recognition of specific virus disease is, from the patient's standpoint, an academic matter; since it avails little. To date chemotherapy offers relief in few instances, and serum therapy has been disappointing. Recognition of the etiological organisms, however, is very important from the public health point of view, because many of the virus diseases are epidemic.

Certain simple laboratory tests may help to differentiate between a viral infection and a bacterial infection. Since viruses are within cells, their primary action results in stimulation or damage to the cells. Pathologically, the presence of the virus is frequently manifested by the appearance of inclusion bodies, which may in some cases be of diagnostic value. The damage to cells may be slight and they may recover, or it may be severe and followed by death of the cells. If the injury is great, an inflammatory reaction may follow and polymorphonuclear leucocytes may surround the dying cell. The usual response to virus infections, however, is not by polymorphonuclear cells but by lymphocytes. In cases of febrile respiratory infections, study of the sedimentation rate and leucocyte count is most useful for the differentiation between virus and bacterial disease. Experience has shown that sulfonamide and penicillin therapy is of little or no avail in the treatment of the majority of virus infections, while both drugs are effective in controlling many of the severe bacterial infections. Patients with a leucocyte count of 15,000 or more are most likely to be the victims of bacterial respiratory infections that will respond to chemotherapy; while those with counts below 10,000 have virus infections that show little or no response to sulfonamides or antibiotics.

In order to prove conclusively that a particular infection is due to a specific agent, it is imperative not only to have serum collected in the period of convalescence, when it should contain antibodies against the agent, but also in the period of acute illness. The "acute phase" serum should not contain antibodies in any appreciable amount. If it contains fewer antibodies than the "convalescent" serum, one may conclude that the change resulted from infection. Several types of immunologic tests are in use in the diagnosis of virus disease. Some are based on odd reactions discovered by accident: the heterophil or sheep cell agglutination test employed diagnostically in infectious mononucleosis and the cold agglutinin test useful in differentiating the various forms of pneumonitis are particularly valuable in the recognition of atypical pneumonia. The chicken red cell agglutination test for influenza virus is of equal value. The most significant antibody test yet devised for diagnosis of virus infections is the neutralization test. To be dependable, this test requires fairly large numbers of animals, careful control studies, and a good collection of known virus strains of proved stable virulence. It is apparent, therefore, that performing neutralization tests is feasible only in special research laboratories. Furthermore, neutralizing antibodies persist for years after latent or manifest virus infections. Their significance is difficult to assess unless both acute and convalescent serums are available for diagnostic purposes.

There is great need for further development of suitable *in vitro* tests that can be performed with noninfectious material and that are specific, such as the complement-fixation tests that have been devised for the diagnosis of psittacosis, influenza, lymphogranuloma, arthropodborne encephalitides, and mumps. Since, at present, the antigens are prepared from infected tissues, they frequently contain relatively little active material. Nonspecific substances from the tissues, however, often interfere with the specificity of the reaction. With the application of modern methods of biochemistry and biophysics, the specific antigen may in the future be concentrated and purified. Obviously, an endless chain of problems confronts the immunochemist who assists in the development of dependable diagnostic devices. It is hoped that in time neutralization tests may be displaced by complement-fixation and other *in vitro* tests. Purified antigens may also prove valuable for allergic skin tests. Notable progress has been made with the Frei test in the detection of chronic lymphogranuloma inguinale. Moreover, the skin test may be more sensitive than the complement-fixation test for the determination of immunity to mumps.

This brief summary of methods presently used in diagnosing virus disease glaringly discloses the inadequacy of the technics thus far developed to aid the clinician in the diagnosis of a disease or the epidemiologist in finding the carriers and shedders of viruses. There is, obviously, much to be done.

*Excerpts from an address by Karl F. Meyer, Dr. Med. Vet.; Dr. Phil., M.D., to the panel on virus diseases, 29th annual session of the American College of Phsicians, San Francisco, April 20, 1948 Reprinted from *Bul. U. S. Army Med. Dept.* 8:713 (September) 1948.

Comments Upon Animal Health Factors

By R. R. DYKSTRA, D.V.M., Manhattan, Kansas

It is doubtful that the so-called hard pad disease in dogs is a specific entity—it seems to bear some relationship to canine distemper. The condition has been reported from England.

In Maryland a proposal has been submitted to cease racing at Pimlico after this season and transfer its activities to the Laurel race course. Pimlico is old, it has an antiquated plant, and is in a limited-space area—115 acres of which only 90 can be utilized, in the city of Baltimore. "Laurel" is modern with 325 acres of space, and an ideal location to draw from both Baltimore and Washington. It will require legislative authorization to effect the change.

G. Pegreffi e D. Mura in Vol. 1, 1947, of Atti Della Societa Italiana Delle Scienze Veterinarie report on the use of arecoline hydrobromide fixed with benzoic acid in aqueous solution for the disinfestation of dogs harboring *Taenia echinococcus*. It is stated that two milligrams of the drug, orally, per kilogram of live weight "determined the whole expulsion of the taenia and does not provoke in the dog valuable troubles." It is also reported that the dosage of the drug not related to the animal's weight has not resulted so favorably.

Filariasis, that bug-a-boo of the small animal practitioner, seems to be in line for more effective handling—in experimental rats and humans at least. The antimony preparations probably suppressed reproduction in the female, and may even have destroyed some adult worms, but as a source of immediate danger a dead adult worm can conceivably be more dangerous than a live one. Also there has been no accurate criterion of the effects of treatment—even the absence of microfilaria in the peripheral blood had limited diagnostic value, because in severe cases there are frequently none. Now it is reported that a promising arsenical has an immediate effect in humans on the microfilaria and that it kills adult worms as well. Technically it is 1-diethyl-carbamyl-4-methyl-piperazine hydrochloride ("hetrazan"). Oral administration in doses 0.5 to 2mg per kilogram of body weight three times daily to humans resulted in rapid disappearance of the microfilaria from the blood stream, and also had action on adult worms. Treatment required from three to 22 days, and practically no toxic reactions were experienced by any of the patients.

Chicks hatched from eggs derived from fowl containing Newcastle disease virus are immune to this infection during their first month of life. During this period vaccination with either killed or living vaccines is valueless. As a rule the immunity established by a killed vaccine is not long lasting. Some living vaccines — these confer more lasting protection—carry with them the possibility of contaminating previously clean premises.

It is reported that in the Ohio State University dairy herd no colostrum is ever discarded. If during the seven days following parturition the dam gives more milk than her calf can consume, then the extra milk is added to the milk ration of other calves less than eight weeks of age. The foster calves thus receive additional amounts of carotene (provitamin A)—the precursor of vitamin A, and lactoglobulins and their passive immunity to disease is raised. "All calves were fed 10% of their body weight daily, either of whole milk or colostrum, or a mixture of both for the first three months." Then the daily allowance was reduced, and at six months of age milk was no longer a part of the ration. Calves so fed made better weight gains and had the general appearance of vigorous health.

Acute pulmonary emphysema of cattle—some research workers prefer the designation "pulmonary edema" because the alveoli, bronchi and interlobular connective tissue contain a serous exudate—continues to be reported from various parts of the world. It has been observed in the clinic of the School of Veterinary Medicine, Kansas State College. Observers are inclined to the belief that there is a relationship between this condition and lush pastures though the chain of events in establishing this relationship has not been determined. *Clostridium welchii* has been recovered in some outbreaks though not uniformly. A combination of enterotoxins and succulent grazing is receiving most consideration from the etiological standpoint. Withholding animals from lush pastures is in order in the present state of our knowledge.

The Veterinary Profession, Animal Disease and the Public Health*

By L. R. DAVENPORT†, D.V.M.
Springfield, Illinois

IT WOULD go without saying, I think, that the annual meeting of this association is motivated by an individual occult desire to nourish the professional and social station we inherited when we were awarded the scholastic distinction of "doctor." We meet here in search of information and inspiration so that we may leave here better qualified both technically and spiritually to solve our professional problems. Most of us try to maintain equilibrium in our understanding, tolerance and equity in our relations with other professions and the lay public but, occasionally, through the normal process of evolution and human relations, situations arise which tend toward individual and professional frustration. Many of us will acknowledge, I am sure, that over recent years such a situation has risen in the veterinary profession.

Reviewing the past for a moment, we recognize, first of all, a change in the character of veterinary medicine. We recognize a change in the character of veterinary practice, particularly in practice subjects and in diagnostic and therapeutic trends. We recognize a change in veterinary educational methods and subject material, and a change in the scope and character of the field of veterinary activity. Second, we recognize a change in economic and social aspects; a change in environment and in our individual ways of life. We recognize a change in human attitudes and behavior. Occasionally, we sense the appearance of intolerance, greed and violation—products of adjustment to a changing situation. We recognize a change in the professional and public need for our services, and an increase in the demands made upon us for service. Finally, although an increased appreciation of our profession has been evidenced, we become aware of a cold critical evaluation of our professional sincerity and ability.

It is only natural for us to hope that other professions and the lay public regard us as educated responsible persons, sensitive to professional and moral ethics and humanitarian ideals. We must realize, however, that we are evaluated by the public and other professions entirely upon the basis of our dignified professional attitudes, and upon our accomplishments. The days of the "horse doctor" are gone, but with the disappearance of equine practice have come new and more important fields for our efforts. With the increase in public awareness of the value of milk as a human food, the dairy cow became of greater veterinary value. Dairy practice has become an attractive and lucrative veterinary activity. With the augmented world-wide need for human food, the beef cattle, swine and poultry industries have developed into greater opportunities for veterinary practice. The present high intrinsic value of animals has been responsible for the development of an attractive field in veterinary research. With the recently increased involvement of animals in the human environment and subsistence the significance of the animal-human health relationship has become of vast importance, and a veterinary public health field has been presented. What then has been lost by the disappearance of the "horse practice?" We might better ask ourselves what has been gained by the transition from equine practice to the modern scope of professional veterinary activity.

We have been forced into adjustment to this transition. Various aspects of such adjustment have disturbed us, particularly the greater demands for more effort and efficiency in ani-

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mal disease control. Under a heavy practice and an unattractive disease control compensation, we have felt a personal vindication in resisting demands for a more efficient brucellosis control. We have felt a professional vindication in this resistance in pointing to a 4% decrease in the bovine brucellosis incidence in this state over the past decade. Persons making the demands, however, have pointed to the thousands of cattle not yet tested for brucellosis; to the past lack of attention to swine brucellosis; to the increased danger to both animals and man represented by the wide range of brucella infectivity and to the steadily increasing undulant fever incidence. We all have to acknowledge our professional indifference toward these things. We are forced to acknowledge a justification for both professional and lay dissatisfaction over our past indifference toward these things. We all have to acknowledge the possibility of future trouble arising out of bovine tuberculosis and other disease dangers to economy and health which now exist in this state. Moreover, we all have to acknowledge the confusion and the lack of coöperation in disease control resulting from a lack of lay understanding and appreciation of disease hazards and the benefits to be realized from more efficient disease control.

We didn't seem to mind so much the loss of poultry disease control to laymen but the recent installation of lay technicians in brucellosis control in some of the states and the possibility that such a thing might happen in the State of Illinois has caused us a great amount of anxiety and, properly so, for such a forfeiture of our professional prestige, in addition to disturbing us, creates an unfavorable impression among those upon whom we depend for our professional elevation. Sensing the possibility of such forfeiture we have patronized the layman but in the absence of any tangible plan for service improvement I doubt that we have convinced the layman that he should not continue to plan for his own protection. It seems unreasonable for us to expect any sympathetic understanding and forbearance from those who utilize our services, so long as animal diseases continue to cause them loss of money and life without some evidence of an aggressive, professional attitude coupled with action on our part toward their protection.

Although not in practice, I want to assure you that as a veterinarian, I have the interests of the veterinarian and the veterinary profession very much at heart. It is not the purpose of this paper to "pick an old sore" or to make demands upon you for the coverage of a new veterinary field, even though the need for veterinary coverage of that field is recognized. Instead, it is my desire to stimulate some sincere dignified thought and planning toward the protection of our profession against future compromise and embarrassment.

Most of us, in one way or another, have become sensitive to pressure. Even though we may recognize the validity of such pressure, most of us have become sensitive to the possibility of encroachment upon our professional field. The mere thought of encroachment disturbs us; first, because it implies to other professions and the lay public that the veterinary profession has not yet become competent. Second, that since veterinarians have been displaced by lay groups to serve economic interests, the possibility of our future displacement in other fields is implied. I resent these uncomplimentary implications as much as anyone and I am as sensitive to our problem as anyone; yet, in all fairness I feel that, as intelligent individuals we cannot expect groups dependent upon our services to remain complacent under loss of money and life and to condone our professional imperception and indifference. It seems only logical to presume that the danger of encroachment upon our profession will continue so long as we assume a defensive position, so long as we allow other professions and lay groups to think for us.

That the veterinary profession has taken a defensive stand is indicated by several things. First, our criticism of veterinary diagnostic facilities implying that the veterinarian can do no better so long as he has to depend upon objective symptoms for his diagnoses. All will agree, I think, that during our college training the perception and use of physiologic attitudes and other objective signs were stressed as fundamental in veterinary clinical diagnosis. Since animals cannot give us a verbal, subjective, description of their aches and pains, we are forced to depend upon certain physiologic or objective signs for symptomatic, clinical, indications of disease. I am sure that all of us have felt an individual and professional pride in the public appreciation and acclaim of veterinary diagnostic ability in the use of objective symptoms. How, then, does our professional abuse of our most publically appreciated and our most cherished professional faculty impress the lay public? In all probability other professions and the lay public are impressed that we are attempting to defend our professional failure

to meet more completely the demands made upon us to control disease. Instead of criticizing our professional facilities we should explain, probably, why we haven't made more extensive use of some of the more technical diagnostic tools which have been made available to us for a confirmation of the vague difficult objective, clinical presentations.

Another indication of our defensive stand can be recognized in the variance in the points of the Illinois brucellosis control program with certain points of the brucellosis control program proposed by the U. S. Livestock Sanitary Association and of programs now in operation in various states, for example; the retention of brucellosis infected animals in herds. This is a practice generally considered to be inconsistent with sound disease control principles, a practice which is not recommended by the national plan. Section 17 of the Illinois brucellosis control law permits a lapse of 60 days between test and sale of female dairy and breeding animals. The program proposed by the U. S. Livestock Sanitary Association permits an interim of only 30 days between the test and sale of such animals, which is recognized by all to be more consistent with good disease control. Since the concessions represented by these brucellosis control program variations are recognized by physicians and ourselves, and no doubt by the alert thinking public, as measures inconsistent with good disease control practices, why do we permit them to exist? Undoubtedly to compensate for a lack of lay understanding and appreciation of the essentials of good disease control—a lack of our professional education of the lay public regarding disease hazards and the economic and social protection to be realized from their eradication.

What about the information we have given the public regarding bovine tuberculosis? Consistently over recent years we have impressed the public that the public danger represented by this disease has been removed, that the number of condemned tuberculous carcasses has been reduced from 47,000 in 1917 to 1,200 in 1947, that no bovine tuberculosis can now be found in the human tuberculosis incidence. We cannot, however, tell the public that bovine tuberculosis no longer exists in this state, and being aware of the present and probable future potentials, we cannot conscientiously tell physicians or the public that there will be no future danger to animal or human health from this disease. Why, then, do we, aware of such potentials and danger, present such information to the public? Obviously to impress the public that we have done a good job in the control of one disease in an effort to avoid both professional and lay criticism for not having done a better job of controlling other animal diseases.

Now let us consider the lay public reaction to such things. Not long ago a prominent representative of the Farm Advisors of Illinois made the following observations on animal disease control in Illinois before a group of approximately 250 livestock and agricultural men. He expressed the recognized need for better educational programs, the need for closer veterinary coöperation with livestock and agricultural interests and, finally, a desire for a brucellosis control program as efficient as the bovine tuberculosis eradication program has been. At the same meeting and before the same group a prominent livestock man made these observations; that hog cholera now represented the minor swine disease problem, implying that such diseases as brucellosis and enteritis are the current swine disease problems in need of solution. This livestock man emphasized the need for a more rigid enforcement of disease control regulations, implying that the control of such diseases as brucellosis, uncontrolled by veterinary science, should be attempted by statutory provisions and policing, which all of us recognize as a poor substitute for scientific disease control management. Such observations by livestock men indicate that they who have investments in livestock and in homes are thinking of ways in which their investments and their families can be protected against animal diseases.

In view of our criticism of our professional facilities and our constant complaint to livestock men and the public concerning problems attending the control of animal diseases, we can't blame these groups for trying to find protective measures outside of the veterinary profession. We can't expect state and federal animal disease control officials to carry the ball for us if our professional "line" is weak. We as intelligent, professional men, not the lay public, should solve our problems. We shouldn't expect the layman to assume our disease control responsibilities any more than we would expect the livestock owner to make a diagnosis or treat a patient for us. It just doesn't seem complimentary to our professional dignity for us to imply even, that the unscientific layman holds the solution to our professional problems. It seems to me that through science, education and dignified management we should be the ones to take the lead in the protection of the livestock owner and the public against animal diseases, and in the protection of our professional prestige.

We must realize that the scope of veterinary activity has been extended, professional and human relations have increased and, accordingly, our professional and social obligations have increased. It must be realized that with the intimate association of animals and man, the steadily increasing human population and an international shortage of animal food items, modern veterinary fields, in addition to economic interests, now either directly or indirectly serve the public health. We as well as other professions, livestock men and the public are aware of this. Veterinary science is needed to keep household pets healthy and safe for human association. Veterinary science is needed to keep the dairy cow in good production and profitable. Veterinary science is needed to keep beef cattle and swine free from disease so that they can mature at a profit into properly nourished, well developed breeding or slaughter animals. Veterinary science is needed to keep sheep free from parasites and disease so that their products and carcasses can be marketed profitably. The same is true of poultry representing a $130,000,000 industry in Illinois.

Recently we have observed conferences urging a more extensive veterinary supervision of the processing of meats and other animal food products. Over recent months veterinary science has been recognized and incorporated into the formal public health service in an effort to effect a greater integration and consolidation of effort toward the protection of health. This veterinary field has developed out of an appreciation by both physicians and the public of the intimate involvement of animals in human health embracing diseases ranging all the way from the acute highly fatal anthrax to allergy and nutritional deficiency, either actively or passively transmitted to the human by animals. Obviously the veterinarian can contribute much to the public security through prompt reporting of animal diseases, the integration of aspects of animal disease and health into the public education and by animal disease prevention and control.

In all of these phases of veterinary public health service, the veterinarian contributes to a better animal health. Prompt reporting of animal diseases provides a prompt knowledge of animal disease incidence enabling prompt initiation of measures for disease control. His effort toward public education in animal diseases conduces to a greater public appreciation of both animal and human health hazards, all of which provides the basis for more appreciated, more efficient and more thorough disease control. I think we should feel a gratification in the formal recognition and incorporation of veterinary science into public health service. I personally should like to see our professional obligation arising out of this recognition discharged by veterinarians and I shall do everything within my power to make that possible. As evidence of this I cite material soon to be distributed among municipal and county police offices urging veterinary examination and observation of animals inflicting bite wounds upon the human. At a meeting of local public health officers not long ago, I urged these men to stress upon physicians and the public the importance of veterinary examination and observation of dogs showing unnatural behavior or inflicting bite wounds. A rabies educational "flyer" soon to be released by the Division of Public Health Education carries the theme of regular veterinary examination and antirabic vaccination of dogs as a public health measure. In our plans to use the brucella "ring test" in undulant fever investigation I have made known throughout the department my desire to place this test in the various local public health districts completely in the hands of veterinarians. As announced by letter, which undoubtedly all of you have received, through coöperation of the Illinois Department of Public Health, the United States Public Health Service, the National Institute of Health and the state and federal disease control agencies, laboratory facilities become available for assistance in the diagnosis study and control of various bacterial viral and mycotic diseases of importance to both animal and human health. These things I shall continue to do but the manner in which they are accepted by veterinarians of the state is, of course, out of my reach.

I am sure that all of us see the individual and professional opportunities now presented in veterinary medicine and it is time I think to take an aggressive attitude and action toward our future professional development and security. I think it is time for us to look our problems squarely in the face, admit the equity and validity of our professional obligations, then get down to some serious impersonal dignified thought and planning for our professional future. In view of the immediate threats to our professional security I can see no justification for complacency. In our future business I think we should keep one thing foremost in our minds and that is that we can't expect livestock interests, other professions or the lay public to respect the veterinary profession unless and until we can demonstrate a recognition of our professional responsibilities and a professional attitude toward meeting them.

Pathogenicity and Lyophilization of Pasteurella Bubaliseptica

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THE strain of *Pasteurella bubaliseptica* used in these studies was originally isolated in pure culture by Dr. L. T. Giltner of the Pathological Division from tissues from an acute case of hemorrhagic septicemia, occurring in March 1922 in an outbreak in buffalo in Yellowstone National Park.

Gochenour[1], who made a study of the biochemical, cultural, and biological characteristics of this strain, which he designated as "hemorrhagic septicemia Buffalo B," reported that it possessed all the characteristics of the Pasteurella group and was highly virulent for all species of domesticated animals. He further reported that the culture retained its full virulence for more than two years after isolation and was especially valuable in the production of a highly potent natural aggressin. On account of this fact the Buffalo B strain was widely used by commercial biological houses for many years in the production of hemorrhagic septicemia aggressin.

In 1929 and 1930, more than seven years following the isolation of the culture, Schoening[2] made further studies on its virulence in connection with experiments on the comparative immunizing value of different types of hemorrhagic septicemia immunizing agents. As a result of these studies he concluded that the method of injection of the culture of the Buffalo B strain is a factor of great importance in the pathogenic action of the culture. He found the organism to be most virulent when injected into muscle tissue, especially when 1cc or less of nutrient broth culture is used. In most cases these amounts injected intramuscularly produced death in animals in 24 to 48 hours, whereas the same amount injected intradermicly produced little or no reactions and when injected subcutaneously without injuring the muscle tissue, failed in most cases to prove fatal. On the other hand, doses of the culture when injected subcutaneously in 5cc amounts produced fatal results. He also observed that the horse is apparently more susceptible to infection with the Buffalo B strain than is the cow, and that a high percentage of the horses that resisted intradermic injection of the culture were immune to subsequent exposure.

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Since Gochenour[1] reported that heifers, bulls, sheep, and hogs could be regularly killed in 24 to 48 hours by subcutaneous injection of 1cc or less of a bouillon culture of the Buffalo B organism for at least two years subsequent to its isolation, it would appear that this strain had lost some of its virulence before it was studied by Schoening[2].

Eichhorn[3] also made some interesting observations while using the Buffalo B strain in aggressin production. He reported that in attempts to infect 350 cattle by subcutaneous injection of cultures made from this strain only 165 cattle were killed. He also pointed out that animals when injected intramuscularly rather than subcutaneously died with a more generalized septicemic condition and without showing extensive edematous infiltration of the tissues.

Purpose of Investigation

From 1922 to 1932 the Buffalo B strain was maintained by transferring to nutrient broth every two weeks and its virulence was maintained by frequent passage through large animals, principally horses and mules.

From 1932 to 1939 the culture was passed less frequently through large animals and gradually became less virulent. Cultures in nutrient broth when injected subcutaneously in 5cc doses failed to kill horses and it was necessary to resort to intramuscular injections of 5cc or more to produce death.

In an attempt to retain the virulence of this strain, cultures isolated direct from the blood of horses killed by injection of the culture were immediately lyophilized (dehydrated under high vacuum while in a frozen state). For this purpose 24-hour cultures of the organisms from serum agar slants were suspended in sterile skimmed milk and lyophilized. Following lyophilization the cultures were stored in the refrigerator at 5° to 10° C.

Although the experiments recorded in this paper were designed and conducted primarily to determine if lyophilization was an effective method of maintaining the viability and virulence of hemorrhagic septicemia organisms of buffalo origin, tests were also conducted to determine what influence the age of the culture, size of the exposure dose, and mode of injection may have on its pathogenicity.

Material and Methods

The cultures of *Pasteurella bubaliseptica* tested for virulence in these experiments represent isolations made from the blood of horses killed by passage of the Buffalo B strain, the culture being designated by tag numbers of the horses from which isolated.

For making exposures to determine pathogenicity, bouillon cultures of the organisms incubated 24 hours or longer were injected into the test animals by different methods of inoculation.

Tests for pathogenicity were made (1) on old cultures maintained in nutrient broth and carried at room temperature, (2) on recently isolated cultures, and (3) on lyophilized cultures that had been held at 5° to 10° C. for a considerable time.

Except when mentioned, the test animals used in these experiments were horses or mules affected with chronic infectious anemia which were previously used in studies on that disease. Early experiments had demonstrated that such animals were as susceptible to the Buffalo B strain as normal animals. A limited number of hogs were also used to determine the pathogenicity of this strain for swine.

The identity of the cultures isolated from

TABLE I.—EFFECT OF INTRAMUSCULAR INJECTION OF HORSES WITH OLD CULTURES OF HEMORRHAGIC SEPTICEMIA (BUFFALO B) IN VARYING AMOUNTS

Culture No.	Status of Culture	Age of Culture*	Date Injected	Dose cc	Results
H 676	Isolated 7-13-32 after passage through horse. One week later pathogenic for 10 horses when injected subcut. in 5cc amount. In 1934 still pathogenic for horses intramuscularly in 1cc amount (maintained in broth).	10	6-24-42	16	Failed to kill
1027	Isolated 6-14-39 after passage through horse (maintained in broth).	3	do	16	do
1027	Isolated 6-14-39 (Lyophilized 6-20-39 and held at 5 to 10° C.)	3	do	10	Killed in 18 hrs.
1226	Isolated 7-27-40	2	do	15	do 24
	Three months later pathogenic for horse in 36 hrs. when injected intramuscularly in 5cc dose, (maintained in broth).			10	do 36
				5	do 36

*Approximate number of years.

TABLE II.—EFFECT OF LYOPHILIZATION ON THE VIRULENCE OF HEMORRHAGIC SEPTICEMIA ORGANISMS (BUFFALO B STRAIN)

Culture No.	Date Lyophilized	Date Tested	Held* after Lyophiliz.	Test for Viability	Test for Virulence: Animal	cc of Culture**	Exposure Method	Results
M 718	6-20-39	10-21-40	1⅓	††	Horse 1225	1	Intramus.	Killed in 36 hr.
do	do	6-26-42	3	††	do 1323	8	do	do 12
do	do	do	3	††	Mule 1329	8	do	do 100
do	do	3- 1-48	8⅔	††	Horse 1263	10	do	do 20
do	do	5- 5-48	8⅚	††	do 1368	5	do	do 48
do	do	do	8⅚	††	do 1384	5	Subcutan.	do 48
do	do	7-13-48	9	††	do 1407	5	do	do 70
do	do	do	9	††	†*do 1403	5	Intramus.	do 24
do	do	11- 2-48	9⅓	††	†Mule 1433	5	do	do 48
do	7- 1-42	3- 1-48	5⅔	††	Horse 1377	10	do	do 24
M 1027	6-20-39	11- 4-40	1⅓	††	Horse 1057	5	Intramus.	Killed in 36 hr.
do	do	6-26-42	3	††	do 1288	10	do	do 18
do	do	3- 1-48	8⅔	††	do 1373	10	do	do 18
do	7- 1-42	do	5⅔	††	do 1374	10	do	do 16
do	do	do	5⅔	††	do 1070	10	do	do 26
1387	2-16-45	3- 1-48	3	††	Horse 1385	10	do	Killed in 18 hr.
do	do	do	3	††	do 1386	10	do	do 24

*Approximate time in years after lyophilization.
†Indicates normal animal; all other horses used in test were affected with chronic infectious anemia.
**Nutrient broth cultures incubated 24 hours or longer used for exposure.
††Indicates viable.

the blood of all animals that died following exposure to the Buffalo B strain was established by tests on diagnostic media and by antigen titrations with the complement-fixation test.

Experimental Data

Experiment A.— (Comparative virulence) of the results of this experiment are given in table I and indicate that unlyophilized cultures maintained in broth for two years were pathogenic for horses in 24 to 36 hours when injected intramuscularly in doses of 5 to 15cc, but similar cultures when held three to ten years failed to kill horses in doses of 16cc. On the other hand, a lyophilized culture (1027), representing the same passage of the strain as the three-year-old culture which was nonpathogenic, killed a horse in 18 hours when 10cc was injected intramuscularly.

Experiment B.—(Effect of lyophilization on the Buffalo B strain). In this experiment tests were made on four different lyophilized cultures of the Buffalo B strain to determine the length of time they remained viable and retained their virulence. The lyophilized cultures were held in storage at 5 to 10° C. for varying periods, were then transferred to nutrient broth, and after incubation for 24 hours or longer were injected into horses or mules either intramuscularly or subcutaneously in amounts varying from 1cc to 10cc.

The results of this experiment are set forth in table II and indicate that lyophilized cultures, after being held in storage at 5 to 10° C. for one year and four months to nine years and four months, were both viable and pathogenic for horses or mules when injected subcutaneously or intramuscularly. Furthermore 15 of the 17 animals killed by injection of lyophilized cultures died in 48 hours or less. It is therefore obvious that lyophilization of recently isolated cultures of hemorrhagic septicemia Buffalo B strain is an excellent method of maintaining both the viability and virulence of the culture.

Experiment C.—(Effect of method of injection and size of exposure dose on the pathogenicity of the Buffalo B strain). The results of this test are given in table III and indicate that a dose of 1cc of the culture, when injected intramuscularly, was pathogenic for horses, but when the same amount was injected intravenously, subcutaneously, or intradermicly it failed to kill them.

On the other hand, 5cc doses of the culture, when given by intravenous, subcutaneous, or intramuscular injection, killed all the test horses in from 18 to 70 hours. One of two horses receiving 2cc intradermicly died in 40 hours, whereas another horse receiving 5cc. intradermicly was not killed. Two of three horses that resisted intradermic exposure and one that resisted subcutaneous exposure were immune when subsequently challenged with a killing dose of the culture by intramuscular injection. A dose of 3cc when injected into 125-pound pigs was pathogenic by intramuscular injection but not by subcutaneous ad-

TABLE III.—EFFECT OF METHOD OF INJECTION AND SIZE OF EXPOSURE DOSE ON PATHOGENICITY OF THE BUFFALO B STRAIN

Culture No.	Status of Culture	Date Tested	Animal	cc of Culture	Method of Injection	Results
M 1225	Recently isolated 48-hour bouillon culture. Isolated on 10-21-40 from horse.	10-26-40	Horse 1189	1	Intrade.	Failed to kill*
		do	do 1227	1	Subcutan.	do **
		do	do 1186	1	Intramus.	Killed in 36 hrs.
M 1186	Recently isolated 48-hour bouillon culture. Isolated on 10-28-40 from horse.	10-30-40	Horse 1107	5	Intrade.	Failed to kill**
		do	do 1190	5	Subcutan.	Killed in 36 hrs.
		do	do 1040	5	Intramus.	do 36
M 718	24-hour bouillon culture made from dried culture lyophilized 5-30-39. Stored in refrigerator at 5 to 10° C. for approximately 9 years.	7-13-48	Horse 1407	5	Subcutan.	Killed in 70 hrs.
		do	do 1408	5	Intraven.	do 18
		do	do 1403	5	Intramus.	do 24
		do	do 1428	2	Intrader.	do 40
		do	do 1406	2	do	Failed to kill**
M 718	Same except stored in the refrigerator for approximately 9 years and 4 months	11- 2-48	Horse 1418	1	Subcutan.	Failed to kill
		do	do 1396	1	Intraven.	do
		do	do 1392	1	Intrader.	do
		do	do 1417	1	Intramus.	Killed in 80 hrs.
		do	Mule 1433	5	do	do 48
M 718	Same as above.	11- 2-48	***Pig 7884	3	Subcutan.	Failed to kill
		do	do 7885	3	Intramus.	Killed in 40 hrs.

*Killed by subsequent intramuscular exposure of 5 cc. of culture.
**Resisted subsequent intramucular exposure of 5 cc. of culture.
***125 pound pig.

ministration. These results confirm the observations of Schoening[2], namely, that when injected in small amounts in horses the organisms of the Buffalo B strain appear to be more virulent when introduced intramuscularly than by other methods, and that a high percentage of the horses that resisted intradermic exposure were immune to subsequent injections of a killing dose of the culture.

Experiment D.—(Pathogenicity of the Buffalo B strain for swine). The results of these tests, shown in table IV, indicated that a 2cc dose injected subcutaneously killed in 40 hours; injected intradermicly it killed in seven days; whereas injected either intravenously or intramuscularly such doses failed to kill. When administered in 10cc doses the culture killed by intramuscular or subcutaneous injection in about 60 hours and by intravenous injection in 13 days. Tissues collected from hogs dead of hemorragic septicemia, when given orally with ground feed, failed to kill normal hogs. In this experiment, it appeared that in hogs, small doses of the organism were most virulent when introduced subcutaneously, whereas in the other experiments, principally with horses, intramuscular inoculation with small doses was the most effective method.

TABLE IV.—PATHOGENICITY OF THE BUFFALO B STRAIN FOR SWINE*

Hog No.	Material Administered**	Date	Amount	Method	Results
5808	24-hr. broth culture M 1305 isolated from a horse.	6-30-42	10 cc.	Intraven.	Killed in 13 days†
5810	do	do	10 cc.	Intramus.	do 60 hrs.
5809	do	do	10 cc.	Subcutan.	do 60 hrs.
5811	Blood, spleen, liver and peritoneal fluid from hog 5808	7-13-42	1.5 gal.	Orally in feed.	Failed to kill
5813	24-hr. broth culture from hog 5809 isolated 7-3-42.	7- 8-42	2 cc.	Intraven.	do
5814	do	do	2 cc.	Intramus.	do
5815	do	do	2 cc.	Subsutan.	Killed in 40 hrs.
5816	do	do	2 cc.	Intrader.	Killed in 7 days†
5817	Blood, spleen, and liver from hog 5815.	7-13-42	1.5 gal.	Orally in feed.	Failed to kill

*Brood sows weighing 550 to 600 pounds. **Recently isolated cultures. †Subacute form of disease.

Summary and Conclusion

Studies made on the pathogenicity of a highly virulent culture of *Pasteurella bubaliseptica* known as the Buffalo B strain and isolated in 1922 indicate that:

1. Although the culture since its isolation had been maintained in nutrient broth at room temperature, transferred frequently and occasionally passed through horses, it was found to be gradually losing its virulence.

2. Cultures recently isolated following passage of the organism through horses were usually highly virulent and retained their pathogenicity for horses for about two years, but when carried on artificial media for three years or longer were no longer pathogenic for horses.

3. Cultures, lyophilized a short time following passage through horses and stored at 5 to 10° C., were determined to be viable and pathogenic for horses from 1⅓ to 9⅓ years following lyophilization, indicating that this is an extremely effective method of maintaining both viability and virulence.

4. The method of injection of the culture and the amount injected appear to play an important rôle in its pathogenic action, especially in horses.

5. In horses the organism was most virulent when injected into muscle tissue, 1cc of a nutrient broth culture in most instances produced death, whereas when introduced subcutaneously, 1cc failed to kill. Intradermic or intravenous injection of 1cc produced little or no reaction. On the other hand, subcutaneous or intravenous injections of 5cc or more usually proved fatal.

6. In heavy hogs, small doses of the culture appeared to be most virulent when injected subcutaneously, and in pigs weighing 125 pounds when injected intramuscularly.

Acknowledgment

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Demyelinating Deseases of Animals*

Part I. Swayback in Lambs

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Introduction

In the last 30 years from studies in medical neurology there has emerged a variety of diseases of different origins, clinical history and pathology, some idiopathic, others post-infective or toxic and some perhaps due to deficiency factors, all of which have the common bond of demyelination as a histological lesion. Whether stress has been unduly laid upon this lesion will remain uncertain until the etiology is clarified. Acuity of onset and course, familial trends and finer histological points have all been used to classify these disorders into a clinico-pathological pattern. As little progress has been made in determining etiology by the direct method of observation on human subjects, speculation has been rife and many theories suggested, none of which have been capable of complete substantiation. Toxins, unknown viruses, allergy, bacteria, spirochetes and vascular mechanisms have all had their vogue. The need for an adequate experimental approach has thus been an urgent one. It is however, apparent that, as Hurst[14] (1944) stated, the production of demyelination in experimental animals has shown succinctly that it could be produced by diverse means. The disparate nature of the agencies used to produce the lesion, e.g. brain emulsions, CO, saponin, cyanides. lead, etc., obviously tends to exclude any common causal determinant more narrowly specific than injury to the white matter. Another cogent statement by Hurst[13] (1942) was that his observations on spontaneous and experimental conditions indicated that there was a series of lesions with cortical necrosis at the one extreme and demyelination at the other and that which finally occurred depended on the initial intensity of the trauma to the white matter.

Twenty-five years ago the term demyelination had not been used in veterinary pathology, but now, many unrelated conditions have been described in different geographical regions in monkeys, lambs, horses, dogs and other animals. However, it might as well be emphasized here that there has been no demyelinating disease of animals described which bears any resemblance to classical multiple sclerosis in man. The general scope of this analytical aspect of comparative neuropathology is traced by King and Meehan[20] (1948) and is not dealt with here except from angles not covered in their paper.

There is a need for closer integration of studies of animal diseases with comparable medical ones and nowhere is the requirement greater than in neuropathological fields. Studies of spontaneous conditions in animals have an intrinsic value towards solving economic problems related to animal health, but they might be used to more advantage in elucidation of human diseases. Animal pathologists may have been guilty in failing to study intensively neurological disorders in animals but there are many reasons for this apparent neglect. Until the end of World War I, the number of research workers actively engaged in veterinary science as a whole, could be numbered in dozens, and veterinary research work even today is largely conditioned by economic considerations and available funds. Further, it is apparent that veterinarians inclined to study pathology have been few and even among them, there has been a bias towards avoiding neuropathology, while the valuable lessons to be learned from past work in the medical field are only now being cultivated.

Any work on demyelinating diseases of animals has importance apart from that of the veterinary aspect and that on swayback and the canine encephalitides are excellent examples in this direction.

Swayback in Lambs

Much was known of the field aspects, incidence, geographical distribution of swayback and even of its non-transmissibility, long before 1935 when its pathological nature was established. A review of the work done in England, Australia and Peru, and with allied research on demyelinating diseases was written in 1943. Since then few publications have appeared which clarify further the complex

*Paper given to Symposium on Multiple Sclerosis, New York, Dec. 10, 1948. Amer. Soc. Nervous and Mental Disorders. Reprinted with permission of the Society and the *Veterinary Record*. The work embodied was carried out while the author was on the staff of the Institute of Animal Pathology, Cambridge University, 1926-40. Original papers dealing with swayback include Innes (1936-1939), Innes and Shearer (1940) Dunlop, Innes, Shearer and Wells (1939) and Shearer, Innes and McDougall (1941).

problem of the pathogenesis of swayback. This paper summarizes what was then established together with other, more recent, relevant observations.

Prior to work in Cambridge, two papers appeared, both of which merit commendation; (1) Lyle Stewart[28] (1932) in England described degeneration (Marchi method) in the ventrolateral columns of the cord in two cases of swayback. (2) Bennett[2] (1932) observed the same lesion in lambs in Australia, the disease there being called enzootic ataxia. By analogy with the location of tracts in the human cord it was then inferred that these degenerations represented an ascending type. The number of cases examined originally by both workers was small which, no doubt, precluded further observations at that time on the pathology, and neither was able to prove the presence of an infectious agent.

Subsequent to the work in Cambridge the following clinico-pathological facts were established: Swayback is a non-febrile, paralytic disorder of new-born and young lambs which had occurred in many parts of Britain for years and to which many names had been given in various localities, all simply indicating weak back. In many regions the incidence in some years had been very high, 70 to 90% of lambs born. In other localities it had a low incidence. It had also varied yearly on the same farm or district, and in yet other areas had occurred with severity for a few years and then disappeared. No particular breed of sheep was exempt, ewes of any age gave birth to affected progeny, although there was a suggestion that the lambs of older ewes were the more susceptible. Affected lambs were born from healthy mothers and were of either sex, single, both of twins or all three of triplets.

The symptoms were those of ataxia and spastic paralysis, which was progressive except in the mildest cases. The lambs were unable to stand, or walked with gross incoördination. Blindness was present in many lambs but they were able to suckle and swallow; defecation and urination were normal. As most of the acute cases were virtually helpless, they were usually killed by the farmers or they died from exposure, malnutrition or secondary infection. With care many could be kept alive for a month or so by artificial feeding. Very mild cases survived to adult breeding life.

The pathology was characterized by symmetrical cerebral demyelination varying in severity in different cases. In the mildest type no macroscopic lesions might be found. In other instances small foci of gelatinous softening were seen, usually affecting the occipital lobes. Severe cases showed extensive degeneration, leading to liquefaction and cavitation extending from pole to pole. In all, there was an accompanying degeneration of motor tracts in the cord and chromatolytic neuronal changes in the red nucleus. It must be accentuated that (1) the cortical grey matter was well preserved, (2) there was an absence of inflammatory changes as seen in the virus encephalitides, and of inclusion bodies. These features were in harmony with current views then, that viruses were not concerned in the demyelinating encephalopathies and that in the virus encephalitides demyelination was not found. This may now have to be reconsidered. One suggestion never satisfactorily explained is in earlier years (until 1930) many more cases of a very mild character had occurred (lambs showing symptoms 6 to 8 weeks old) while later (about 1935 onwards) the more acute type of case in new-born lambs predominated. Since before 1930 few, if any, of these mild types were examined by anyone with attention to pathological detail, the question arises as to whether they were actually swayback. This may be quite important since, as the disease became clarified, it is evident that almost any clinical paralysis in lambs was given the label swayback. In the diagnosis of nervous disorders of sheep, however, there are limitations on what can be accomplished by clinical examination alone; more reliance is probably placed upon flock history than on detailed clinical and pathological examination of a single animal. The facts remain that cases of (1) purulent osteomyelitis of vertebrae with extension to meninges and cord, (2) myopathy and (3) inherited cerebellar atrophy, have been identified in suspected clinical cases of swayback in lambs and that all of these might have been confused by farmers and practitioners (Innes, Rowlands & Parry[19], (1949)).

Certain conclusions were reached in 1939 which can be recapitulated: (1) Swayback could be placed in the category of the demyelinating encephalopathies and all observations indicated that the lesion originated late in gestation. (2) Whatever the causal agent was it had a specific affinity for cerebral myelin, or for the mechanism mediating its fetal maturation, while that same agency had no pathogenic effect on the adult nervous system. (3) In all cases the brain was of normal dimensions, even in severe cases, and lipoid breakdown products were present, although not abundant, in softened areas. These features plus the degenerative lesions in the red nucleus and motor tracts supported the belief that the essential lesion was demyelina-

tion and not an aplasia of myelin. (4) Bearing in mind that there might be differences in reaction of the developing lamb brain compared with that of the human fetus it was considered that there was some similarity between swayback and Schilder's disease (encephalitis periaxialis diffusa) in children. (5) The apparent precocious maturity of development of the lamb brain might be of the utmost importance in consideration of pathogenesis (the weight of the brain of the new born lamb is about 80gm and that of the adult sheep about 95gm, so that relatively little postnatal growth occurs (c.f. weight of the brain of the new born babe and of the human adult). Cerebral myelination is almost fully developed at birth and that of the cerebellum even much earlier.

It was clear that little advance would come from any stereotyped approach regarding etiology. The possibilities of swayback being due to an infectious agent, to hereditary influences, or to known nutritional deficiency factors were apparently excluded. The probability, however, that it was a form of congenital plumbism was considered before any work was done in Derbyshire, in an area formerly intensely mined for lead, dating back to Roman times. Farmers there believed swayback was due to lead poisoning and gave it the name "beliand" which originally had some connotation to lead ore. All work done in this connection was indecisive and in any case it could apply only to Derbyshire and not to other large, sheep-rearing areas, where there had been no lead mines so that the occurrence of swayback in Derbyshire, Yorkshire and the Mendips had perhaps focused too much attention on the heavy metal.

Bennetts and Chapman[3] (1937) in West Australia [See Bennetts and Beck[4] (1942) for a full account of the Australian work] gave a much needed stimulus to further investigation when they suggested that the disease in Australia was due to a copper deficiency. Confirmation that the pathology was identical with swayback did not come until later. By 1942 the disease in Australia was found to be more widespread than was first thought, and its distribution coincided with a low copper status of affected stock, and connected cereal and pasture problems. These observations of Bennetts *et al.* no doubt arose consequent to the intensive Australian work on trace elements in general and their importance in animal health. This work opened up a wide sphere of research. In 1937 they believed that pregnant ewes pastured on land deficient in trace minerals, developed a macrocytic, hyperchromic anemia, comparable to pernicious anemia in man and that, as a result, the lamb progeny were affected with a nervous disorder. They showed that the feeding of copper supplements to pregnant ewes prevented the disease. Subsequently much laboratory and field work was done in England which confirmed at least that the disease could be prevented by feeding copper in salt licks or by individual dosing of pregnant ewes in swayback areas. However, there were several discrepancies between English and Australian results and the views expressed in 1943 are a reflection of what was known then and little has been added since. Although copper has this peculiar prophylactic effect against swayback, nothing is known about the complex question of pathogenesis of the disease either in England or Australia, or in what manner copper facilitates correct myelination. We were unable to confirm that there was an associated specific anemia in the mothers of the affected lambs in England. Anemia was occasionally present but it was not an essential part of the syndrome and could not be compared with pernicious anemia in man. This was also the view expressed by McDonald[21] (1942) in South Australia. It was clear that the disease was not a copper deficiency *per se*, because it occurred in areas in which the copper content of pasture and soil was normal. While low copper values of blood and liver of the ewes or affected lambs were usually found, ewes with low copper blood values did not necessarily give birth to swayback lambs. It was postulated therefore, that; (1) copper might be present in the grass in a form that pregnant ewes could not absorb, (2) there might be certain alimentary dysfunction, or (3) there might be some unknown factor present in pastures which inhibited the absorption of copper. The recent observations of Dick and Bull[5] (1945) might be a pointer in this latter direction. These authors showed that the presence of molybdenum in grass, or even the feeding of this element, had a marked depressive effect on copper metabolism in sheep. That there is some competition between molybdenum and copper in ruminant metabolism is also evident from the fact that "teart," a dysenteric condition of cattle and to a lesser extent of sheep in South England due to excess molybdenum in pasture, can be cured by giving copper. (Ferguson[12] *et al.* 1943). The same condition occurs in Wyoming, (Beath[1] *et al.* 1934). The pathogenesis of swayback is thus one of great complexity, for clearly the "deficiency" is conditioned to affect only the developing lamb when myelination is at the height of its activity, *i.e.* the latter three to four weeks of gestation.

The same disease was described in Peru, where it was known as "renguerra" (wobbly back). It was first recognized clinically by Tabusso[27] in 1914 but in 1942 pathological examination established its identity with swayback, and copper was also found to have a beneficial prophylactic effect. It is interesting to note that it occurred in a wide area *(Cordillera)* which is one of the great copper mining regions of South America, and that the disease apparently caused losses to an extent never experienced in England or Australia. Tabusso[27] (1942) stated that swayback occurred also in the alpaca, the vicuna, and the llama, all of which are herbiverous ruminants, chew the cud, carry wool and all have an extremely long gestation period. The young all have a developmental precocity similar to that of the lamb at birth, *i.e.* they are able to walk and thus presumably have almost mature natal cerebral myelination.*

The disease has also been seen in New Zealand by Cunningham[6] (1946). The possibility of confusing swayback in lambs with other paralyses due to myopathies, cerebellar atrophy, birth injuries, traumatic or infectious conditions of vertebrae or spinal cord, makes suspect the recorded clinical similarity of lamb conditions in Sweden, India and South Africa, unless this had been substantiated by pathological examination of the nervous system which was not done.

Perhaps little advance can now be expected to arise from studies of the natural disease and in any event would not be easy because of the wide prophylactic use of copper. (Shearer and McDougall[24] (1944) and Eden and Green[10], 1940). Advances in other fields may effect important leads. Trace element deficiencies affecting domestic animals, exist over widely scattered areas of the world's surface. Many such deficiencies may be complex, which may complicate the picture. Further, it is evident there is a great species variation in susceptibility to these various deficiencies and that the

*This might be an extremely important observation in relation to species, (and organ-localization) susceptibility to the pathogenic effects of trace element deficiencies.

Apparently the condition of a pregnant ewe, which seems responsible for lambs affected at birth, is not a copper deficiency *per se;* although when ewes are fed copper supplements for a few weeks late in gestation, swayback in the lambs is prevented. It has been shown that the presence of molybdenum in grass has a marked depressive effect on copper metabolism in sheep. Since a dysenteric condition of cattle, and to a lesser extent of sheep, which in England is called "teart" can be cured by the administration of copper, it would seem that there is a relationship in the metabolism of copper and molybdenum.

pathological reaction varies fundamentally from animal to animal. In England, at least, apart from swayback no other manifestation of copper deficiency has been defined in adult sheep or any other domestic animal. In Holland and Schleswig-Holstein, copper deficiency initiates a marasmic anemic condition of cattle called "lecksucht"†, but no pathological condition comparable to swayback in sheep has been found. In Australia copper deficiency in adult sheep causes a peculiar condition of the wool (stringy or steely) characterized by loss of crimp, but this is unknown in the wool trade in England. Bennetts has drawn attention to posterior paralysis in pigs said to be cured by supplements of limonite and copper. In other areas of Southwest Australia, Bennetts, Harley and Evans[5] (1939, 1941, 1942) have described yet another syndrome in cattle "falling disease" the essential lesion of which is anemia, myocardial degeneration, fibrosis and consequent cardiac catastrophe, and this is said to be prevented by copper. In the U.S.A. Olafson[22] (1942) recorded a peculiar ataxia in foals and yearlings which on pathological grounds was compared with swayback. Unfortunately this could not be followed up regarding the possible etiological rôle of copper. There is thus a great field still awaiting exploration.

Deficiency of cobalt is known to cause severe marasmus and anemia in sheep "pine" in England and Australia. The recent important observations of Tosic and Mitchell[26] (1948) may be a pointer to further work on copper deficiency and swayback. These workers observed that the cobalt concentration of the microflora of the sheep's rumen depended on the cobalt content of the diet. Obviously one avenue to be explored is to determine whether in "pine" the deficiency is really a complex of cobalt plus the products of rumen bacteria rather than the element alone. This valuable observation might be correlated with the suggestion that cobalt is effective against "pine" only when given orally.

Some publicity has been given to the record of cases of multiple sclerosis amongst a small group of workers who were involved in work on swayback. Campbell[7] *et al.* (1947). No extravagant claims were made in this paper. It was considered that these cases and their histories were facts which should, at least, be made known. The contrast between swayback in lambs, in all its manifestations, with the classical protracted course of multiple sclerosis (disseminated in space and time) was stressed. The possibility that the four cases might be a strange example of the long arm of coincidence was dispassionately considered. In my own view these observations are far less important than the original work which was done on this lamb condition in Australia and England. Investigations of such animal conditions have an immediate practical value but they may have repercussions in medical research. Some information might be obtained on demyelination as a process while the apparent mysterious rôle of copper in swayback helps to focus attention on the possibility that trace elements may play a part in certain human demyelinating diseases.

†Ferens (1941) described three clinical conditions in cattle due to copper deficiency, (a) cattle licking everything within sight, (b) pasture diarrhea and loss of pigmentation of black hair around the eyes and (c) retardation of growth, emaciation and greying of hair.

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Steatitis (Yellow Fat) in Mink

By G. R. Hartsough*, D.V.M. and John R. Gorham**, D.V.M., M.S.

Steatitis is an acute, subacute or chronic disease of young mink characterized by a nonsuppurative inflammation of the depot fat and a subcutaneous edema. Definite information as to the etiology and control is lacking.

This disease has been referred to as "yellow fat" by McDermid and Ott.[1] Quortrup, Gorham, and Davis[2] described the pathology of the disease and found it to be similar to nonsuppurative panniculitis (Weber-Christian disease) in man. Chaddock[3] used the term "yellow fat" synonymously with fatty degeneration of the liver. Apparently, he was describing a syndrome other than the one commonly referred to as "yellow fat" inasmuch as the typical condition affects only young mink. Fatty changes of the liver in this condition are not characteristic. In Alaska, a malady identical with steatitis is known as "watery hide disease."

Occurrence in the North Central Region

Steatitis (inflammation of adipose tissue) has been recognized as a separate and distinct entity in Wisconsin since 1942. It probably occurred rather frequently before that time, but was not recognized as a specific disease and possibly was diagnosed as vitamin B_1 deficiency.

In this region, it appears that the disease may be associated with the feeding of rather high percentages of storage meats and fish; that is, meats and fish (especially fish scrap) that have been in storage longer than six months. Ranchers who butcher their own horses and feed a considerable percentage of fresh horse meat, that has never been frozen or has been frozen for only a short time, have not reported this condition.

Occurrence in the Pacific Northwest

The first authentic report in which the malady, was recognized as a distinct entity, was made in the summer of 1946; before that time, losses were attributed to food poisoning or vitamin B_1 deficiency. Although it is not definitely known, it is believed that the losses were not as large in previous years as they were during the disastrous outbreaks of 1947 and 1948.

In this area, steatitis may be associated with the lack of horse meat and liver in the ration. Both are becoming expensive, and as a result, mink ranchers are feeding more fish scrap now than formerly. Adult mink are not affected by this type of ration, but kits if fed heavily on fish scrap (especially fish that has been stored) with no horse meat or liver in the ration, steatitis is likely to occur.

Steatitis in mink is characterized by marked and severe symptoms and a serious mortality rate among young animals. Veterinarians are reminded of the high incidence of this disease during late summer.

Symptoms (Both Regions)

This disease affects only young mink and usually occurs shortly after weaning, when the kits are eating large amounts of solid food. The majority of outbreaks occur in the last two weeks of July and the first two weeks of August. Some outbreaks may begin late in September, and losses may continue until pelting time. The kits may or may not be separated. In pens where the whole litter is kept together, the largest, most likely appearing kit is often the first affected.

The condition usually appears suddenly with no prodromal symptoms; a few dead animals

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being the first indication that something is wrong. The kits may refuse the night's feeding and be dead in the morning. Other animals may leave their feed. On careful examination, affected kits are seen to move with a peculiar, unsteady hop. This unnatural gait may become progressively worse until they are unable to move at all. They seem to flatten out on the wire and push themselves on the abdomen. A comment made by mink farmers at this time is, "they appear wider than they are long." After the first day, affected individuals may start to eat sparingly and some of them develop a surprisingly good appetite. The symptoms are often accentuated after a full meal. The animals become comatose shortly before death.

Kits that recover from the initial attack often do not fur out well. Breeding efficiency of those that survive an outbreak has not been accurately ascertained. Nothing is known as to whether mink, when affected with steatitis, become more susceptible to other ailments, such as distemper. One of us (J.R.G.) has seen distemper and steatitis in the same animal.

The number of animals affected in each outbreak may vary from 2 to 3% to 50%. The mortality of those showing symptoms is from 50 to 75%. In a typical outbreak, 10 to 50% of the kit crop may succumb. In some cases, there appears to be marked tendency for a high percentage of all the kits in a litter to be affected, even though they are separated and placed some distance apart prior to the outbreak.

Pathology (Both Regions)

At necropsy, the posterior floor of the abdomen and inguinal region appear thickened and doughy on palpation. The abdominal muscles lack tone. When the region is incised, a marked subcutaneous edema is found which varies in consistency in individual animals. In some cases, it is thin and watery, whereas in others it becomes thicker and somewhat gelatinous; hemorrhage is not uncommon. The subcutaneous fat has a characteristic brownish yellow color and is either doughy or firm on palpation. In the majority of cases, it has a distinctive odor not unlike, rancid fat elsewhere. Numerous petechiate hemmorrhages may be present throughout the fat; no suppuration nor necrosis is seen.

When the abdominal cavity is examined, the vessels in the mesentery and omentum may be congested. The mesenteric lymph nodes are often swollen and edematous. A rather striking pallor of the gastrointestinal tract is noted in many cases. The spleen is often enlarged to as much as two to three times its normal size and may be mottled. The kidneys are usually normal in appearance; however, in acute cases they may show marked hemorrhages and present a raspberry jam consistency. In each outbreak, the number of animals having this kidney lesion, does not exceed 15% and, in some outbreaks, it is not seen. The first fatal cases in acute outbreaks are more apt to have extensive hemorrhages in the kidneys. The liver is normal in appearance. The intestinal tract may show catarrhal enteritis.

The pleural cavity shows no changes other than occasional petechial hemorrhages in the lungs. Varying degrees of hypostatic congestion are often noted.

Microscopically, the most significant observation is a nonsuppurative inflammation of the subcutaneous and visceral fat. The microscopic pathology has been previously described.[3]

The blood picture is considerably altered. The leucocytes are markedly increased; seldom is the number below 25,000 and it may be as high as 38,000. The red blood cell count often shows varying degrees of anemia. In acute cases, the number of erythrocytes may fall to 3,000,000. In subacute and chronic cases, it is usually 6,000,000 to 7,500,000. In acute cases, a hemoglobinuria is noted, the urine being dark brown in color.

Control (Both Regions)

The cause of the condition is unknown. McDermid and Ott[1] postulated that it was due to heavy protein feeding; however, further studies indicate such does not appear to be the case, as some ranchers feed high protein diets without experiencing trouble. Although heavy feeding does not seem to be the initial cause of the condition, the symptoms may be accentuated by it and losses, may be retarded somewhat by restricting food intake.

On ranches where the disease is in progress, it appears that the best means of arresting the outbreak is to change the ration immediately so that it contains a large amount of fresh, unfrozen horse meat, and to limit the food intake of those visibly affected. When fresh horse meat is fed, 10 to 15 days are required before improvement is noted. Fresh liver is also indicated.

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New Drugs for Veterinary Medicinal Uses

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DURING the past year, a great deal of interest in marketing new drugs has been shown by manufacturers of veterinary medicinal preparations. Apparently, some manufacturers find it difficult to understand what constitutes a new drug, and the circumstances under which a drug might cease to be new.

Any drug or any component thereof, whether active or not, is, in our opinion, a new drug as defined by the federal Food, Drug and Cosmetic Act if there is any question as to its safety, when used as directed for a prescribed purpose, or if its safety for such purpose is not generally recognized by experts qualified by scientific training and experience to investigate the safety of drugs. Even though scientific experiments with a drug may have extended over several years, as in the case of some of the newer sulfonamides, it may still be regarded as a new drug until such time as it has been used under practical conditions for a material period or to a material extent, permitting general recognition by experts of safety under such conditions. This viewpoint is particularly applicable to those drugs which have narrow margins of safety. Benzene hexachloride and chlordane for the treatment of mange or scabies of animals fall into this category in spite of the fact that they have been used experimentally for a long time. They are highly toxic chemicals which are readily absorbed by the skin. We are not yet convinced that they can be indiscriminately used by the public for treating animals, especially pet animals, without harmful effects.

Some of the older, well-known drugs, such as arsenic and strychnine preparations, may be new drugs if little or nothing is known, from a scientific standpoint, about their safety in doses which can be depended upon to exert some physiological or pharmacological activity, as for example, some of the organic arsenical compounds which are now recognized as having some value as preventives of cecal coccidiosis in chickens. Some may be surprised that we have mentioned strychnine in this category in view of the fact that many of the so-called poultry and stock tonics contain strychnine in one form or another. From our experience, we are convinced that many so-called poultry tonics do not furnish sufficient amounts of strychnine when used as directed to be physiologically active. On the other hand, there is little or no scientific evidence to show the safety of strychnine when furnished to poultry in physiologically active amounts.

Most manufacturers realize that a new drug, as defined by the Act, cannot be shipped legally in interstate commerce until an application with respect to it has become effective, as provided for by section 505 of the Act. This section is intended to protect the public from the hazards attending the manufacture and distribution of new drugs which have not been investigated adequately to insure their safety for use. The fact that several manufacturers have obtained new drug applications for a particular preparation does not relieve other manufacturers of a similar or identical formula from the responsibility of also obtaining an effective new drug application.

Regulations under section 505(i) of the Act provide a set of circumstances under which a new drug, intended solely for investigational use, may be exempt from the requirement that an effective new drug application must be obtained before shipment in interstate commerce. Under this regulation, the label of such drug must bear the statement "CAUTION: New drug—limited by Federal law to investigational use." The regulation further provides that each shipment or delivery of such drug shall be made only to an expert qualified by scientific training and experience to investigate the safety of such drug and solely for investigational use under his direction. The person who introduced such shipment or delivery into interstate commerce shall keep complete records showing the date and quantity of each shipment and delivery. Such person, prior to making such shipment or delivery, shall obtain a statement signed by such expert showing that he has adequate facilities for the investigation to be conducted by him, and that such drug will be used solely by him or under his direction for the investigation, unless and until an application becomes effective with respect to such drug under section 505 of the Act. The investigator shall keep the statement, and make all documents referred to available for inspection upon the request of any officer or employee of the Agency at any reasonable hour until three years after the introduction of such shipment or delivery into interstate commerce.

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Obviously, livestock and poultry raisers cannot qualify as experts to comply with the requirements of the regulation and it is therefore illegal to ship a drug under the caution statement in interstate commerce to livestock and poultry raisers for their own investigational use. It has been our experience that comparatively few manufacturers of veterinary medical preparations appreciate the importance of the provisions of this exemption.

The experimental data received from such experts must be factual, detailed and complete to fulfill the requirements of section 505(b) (1) of the application. Moreover, such data must be furnished in duplicate when submitting a new drug application as provided by the regulations. Occasionally, we still receive only a single copy of an application. Such applications cannot be accepted for filing with the Administrator. Forms for the submission of a new drug application in duplicate are furnished by the Food and Drug Administration upon request. The forms explain in considerable detail the type of information of which each duplicate application should consist. The details should be followed carefully in preparing an application.

Most manufacturers who have adequate chemical facilities do not rely on guaranty but make their own analysis of raw materials to be used in their products.

One of the most important features of a new drug application, which we consider in determining completeness for filing, is the information contained in the description of the methods used in, and the facilities and controls used for, the manufacture, processing and packing of the drug. Frequently, uninformed persons, when submitting an application, state that they purchase the raw materials from reliable manufacturers of chemicals or drugs. This is not sufficient to insure proper identity, strength and purity of the raw materials used in the manufacture of the drug. In this connection a manufacturer may take advantage of the regulation under section 303(c) of the Act by purchasing the raw materials under a valid guaranty, as provided for in the regulation. He must be in a position to show, by documentary evidence, that each batch of the raw material he receives is accompanied by a limited form for use on an invoice or bill of sale or a general or continuing form worded according to the forms mentioned in the regulation. Most manufacturers who have adequate chemical facilities available do not rely on such a guaranty but make their own chemical analysis of each batch of the raw material to provide assurance that specifications are met. In any event, representative samples of each batch of the finished article must be checked by chemical means to be certain, in the protection of the purchasing or consuming public, that the finished article is in accord with the formula.

While it is true that a new drug application deals solely with the safety of the drug, we must take into consideration the directions for use of the drug for its intended purpose in assuring ourselves of its safety. In this connection we must consider carefully, whether the experimental data show definitely that the drug is safe when used for such intended purpose or purposes. It is well known to experts in the field of chemotherapy that a drug may be safe for a normal animal but may not be safe for a sick animal which may be more susceptible to the toxic action of the drug. We must also take into consideration all warnings or precautions which may be indicated in the labeling. The experimental data may show the drug to possess some toxicity in the prevention or treatment of the disease condition for which it is intended. In such cases we evaluate the experimental data carefully to determine if the value of the drug in a given case is more important than some of the harmful effects it may be capable of producing. Should it be decided that the value of the drug does outweigh its harmful effects, we would make the application effective if the labeling is sufficiently informative to put the user on guard against its dangers.

In our consideration of applications for new drugs for veterinary use we have, in addition, taken into consideration, when dealing with highly toxic drugs, whether or not the experi-

mental data are sufficiently complete to show that the treated animal or bird is safe for human consumption. This is of utmost importance for those drugs intended to be used over a long period in the prevention of disease or to affect the physiological function of the animal. If the experimental data show that the drug is not cumulative and disappears from the edible tissues of the animal within a few days after the medication has been discontinued, we have taken into consideration the warning or caution statement in the labeling to the effect that the medication should be discontinued for four or five days before marketing the animal or bird for human consumption to allow for the elimination of the drug from the edible tissues. This has been an important consideration in connection with the new drug applications we have received for thiouracil to promote fattening of certain species of animals. These applications which we were not in a position to make effective, prompted the FDA to announce a statement of general policy or interpretation for consideration of new drugs intended for animal use. This information was published in the *Federal Register* December 4, 1948, as follows:

"A number of products have been developed to promote fattening, increase milk or egg production, or effect other physiological changes in farm animals. Many of these compounds contain as active ingredients substances the toxicity of which is known to be of a high order. For example, thiouracil, a very potent drug, has been proposed for use to promote fattening. When such substances are added to food they render the food adulterated under section 402(a) of the Federal Food, Drugs, and Cosmetic Act.

"The Federal Security Agency regards sections 402(a) (2) and 406 of the act as clear enunciations of Congressional intent to deny the channels of interstate commerce to food containing added poisonous or deleterious ingredients which are unnecessary in its production or which can be avoided by good manufacturing practice.

"Since these compounds are intended to affect the structure or function of the body of animals and have not been previously used for such purposes, they are regarded as new drugs, requiring the submission of adequate evidence of their safety, as required by section 505 of the act, before being marketed in interstate commerce.

"In considering a new drug application for a product intended to effect physiological changes in farm animals, the Federal Security Agency will regard the absence of satisfactory evidence showing that the meat or other food obtained from animals fed the drug is entirely free of any poisonous or deleterious ingredient resulting therefrom at the time of marketing as ground for refusal to make the application effective."

In some instances a manufacturer of a basic chemical or drug may develop all of the experimental evidence to show the safety and efficacy of the drug for a specific purpose or purposes sufficient to obtain an effective new drug application. The manufacturer who obtains an effective new drug application may be interested only in the manufacture of the pure chemical or drug for use by other manufacturers as an active drug ingredient in their own compounds. In such cases where a manufacturer may purchase and use the chemical or drug as an active drug ingredient in his own preparation, it is necessary for him to obtain an effective new drug application for his own compound or formula. In the fulfillment of section 505(b)(1) of the Act the manufacturer of the compound or formula may request the manufacturer of the basic active drug ingredient to authorize the Agency to consider in his behalf all the experimental data showing the safety and efficacy of the drug submitted in obtaining the original effective new drug application. Under such circumstances it may not be necessary for the manufacturer of the new compound to submit any additional data concerning the safety and efficacy of the active drug ingredient. Please bear in mind that I stated it *may* not be necessary since under some circumstances it may be a new drug for which the original experimental data may not be applicable. However, it will be necessary for each manufacturer to describe in detail the methods he uses in the manufacture, processing and packing of the drug and the facilities and controls used for such purposes.

Many manufacturers of poultry feeds have taken advantage of such a situation by purchasing a chemical or drug from the basic manufacturer and mixing it in a feed base. Even though the active drug is incorporated in a complete feed base the finished product comes within the definition of the term "drug" and in the case of a new drug a manufacturer must obtain an effective new drug application. In preparing the label or labeling the feed manufacturer must comply with the provisions of the Act dealing with drugs and the label should not suggest or imply in any manner that it is a feed for feeding purposes. In other words, the feed ingredients should be considered as a vehicle for incorporating the drug for the convenience of the poultry raiser in administering the drug as directed in the labeling.

It is hoped that the information in this paper will be helpful to those manufacturers and others who have not clearly understood all of the factors involved in the submission of a new drug application, and the responsibility of this Administration in making such new drug applications effective.

Don't Pay Twice for New Buildings

By HAROLD J. ASHE
Compton, California

VETERINARIANS now building or about to build should be on notice that, if they do not exercise diligence and foresight new buildings, additions and alterations, even maintenance repairs may cost them much more than the contract price.

Usually, where major construction is involved, the owner will employ a general contractor. Periodically, payments will be made as the job progressess, and the veterinarian may erroneously conclude that there his responsibility ends. With the final payment he may assume that, except for such financing as he is aware of, the building is his, free and clear of encumbrance. If, however, at some point in the progress of these payments from general contractor to sub-contractor to material supply houses and to mechanics employed on the job, there has been a failure to satisfy claims arising from the job, the owner may find himself confronted with from one to a score or more liens on his building.

The majority of states now have some form of lien law designed to protect material supply houses, contractors and mechanics. These laws stand unique in contractual relations, and few building owners are aware of the peculiar character of these laws or how innocent third parties may be penalized. Historically, these laws have been placed on the statute books to correct a widespread abuse by which suppliers, mechanics and, sometimes, subcontractors were left unpaid, and without recourse, where either general or subcontractors received payment but failed, in turn, to settle outstanding bills incurred in performance of contract. Now, in fact, the mechanics, suppliers and subcontractors can legally turn to the building owner for satisfaction of their claims, if otherwise not satisfied. This can be done even though they have no direct contract or agreement with the building owner. The fact that the owner has paid the general contractor does not remove the owner's legal liability to subcontractors and/or suppliers and mechanics.

Therefore, veterinarians should not conclude that their responsibility ends with payment of sums called for in the contract with the general contractor. Even though the general contractor may be able to present tangible evidence that he has paid his subcontractors, this is still no assurance that suppliers and mechanics of these subcontractors have been paid. At any point along the line from general contractor to subcontractors' employees and suppliers, there may be a stoppage of payment, giving rise to a lien against the building.

Generally, the building owner should scrutinize most carefully the competitive bids. The lowest bid very well may be the signal for danger ahead, if it appears to be too low to permit the performance of a first-class job. It may certainly indicate a financially irresponsible general contractor who does not know his true costs, and who may feel obliged to indulge in sharp practices to protect himself.

It is usually not within the province of the owner to investigate the subcontractors used by the general contractor. However, if there are local or state contractors licensing laws, it will afford some small measure of protection to insist that only licensed subcontractors be employed. Legal shoals may be ahead for the owner if such subcontractors do not carry workmen's compensation or accident insurance.

However, ensuring that the general and subcontractors are licensed and insured is not enough. Some of the most flagrant cases involving liens on buildings concern licensed contractors. Taking a loss on a job they frequently have been known to pack up and leave town, failing to pay material bills or such wages as they can evade.

Practically, about all most licensing authorities can do is rescind licenses, a penalty such contractors are reconciled to when they jump the job. Granting of licenses in the first place is usually less on the basis of personal integrity and known financial responsibility than upon mechanical skill of licensees. Court cases seldom recover misused funds from such contractors because, even when apprehended, they rarely have resources. If they had they would probably have stayed and honored their just debts.

Probably in no other field of endeavor is it still possible to engage in such large operations with so little resources, as in the building trades. In fact, the lien laws actually encourage this condition in a left-handed manner by ensuring payment of material bills by building owners. Supply houses readily lay down materials on job sites with scant consideration of the credit status of contractors, knowing their goods are protected by progress of the building. Some of the building trades subcontractors can employ crews of a dozen or more men with only a few hundred dollars in equipment, depending only upon the type of construction involved, and by freely renting heavy equipment. Sometimes the general contractor for smaller

jobs may simply be an erstwhile, journeyman carpenter who has stepped out with limited funds, corraled contracts, and sublet them to subcontractors, with an assured over-ride for himself, and little risk.

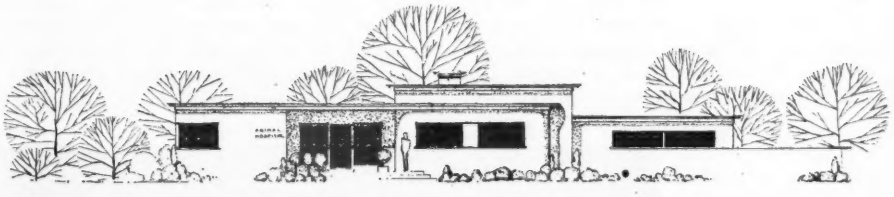
The foregoing picture is not intended as an indictment of the building trades, or the many honorable men in it, but is merely to focus attention on that small minority which makes publication of such an article as this necessary. Ethical contractors are the first to condemn the unethical, the cut-throats, the jack-legs. The writer, a one-time building contractor, knows that liens by mechanics, subcontractors or material supply houses are much more common than is generally known. Except in unusual cases, these lien actions are not reported in newspapers.

Builders, however, where lien laws exist, have a sure means of protecting themselves against liens. This protection is afforded them if they insist at the time the contract is executed that progress and completion payments will be made only following presentation of material and labor releases. These releases should state that material bills have been paid or waived, and that mechanics wage claims have been satisfied to date. These releases should originate through subcontractors and come to the building owner from the general contractor.

It should again be emphasized that, in those states having such lien laws, the lien rides with the property until it is satisfied. The fact that somewhere along the line a general or subcontractor has failed to meet his obligations arising from the contract is no defense legally for the building owner, even though such action by the contractor may give rise to a separate civil or criminal suit against him.

What has here been said of jobs performed through general contractors applies with equal force to maintenance types of work performed by a specialized contractor, such as a painting job, installation of new glass, or repair of a heating system. Any improvement or repair made by building tradesmen to an already built structure may result in a lien against the building, if any claimant has been unpaid.

It may prove to be a profitable employment of time for either the owner, or someone representing his interests, to carefully note the materials laid down on the job, the number of workmen engaged day by day by each subcontractor, and to evaluate these data in checking the material and labor releases tendered. Occasionally a subcontractor may receive materials for a job from two or more supply houses, but furnish a release from only one. Or he may turn in labor releases from only part of his job crew.



Material releases should indicate, preferably, the quantity and kinds of materials laid down on the job, and when, and indicate that suppliers have been paid for such specified materials or that they waive any claim for payment against the job. These releases should be on supply house stationery and be signed by a responsible firm member.

Labor releases should state, that the mechanic signing waives wage claims to date of signing, or that he has received wage payment in full to date.

Releases signed by subcontractors, themselves, and sometimes tendered in lieu of material and labor releases, are of no value whatsoever, except to show that the subcontractors have received payments. They should be obtained but they are no protection against liens for materials or labor.

Perhaps a reader may feel so sure of the integrity of a contractor he may hesitate to employ the safeguards outlined. Assuming this integrity is beyond question, there is always the possibility of sudden death of the contractor while the job is in progress. If progress payments have been made, and no releases have been supplied, it may develop that the supply houses have received no payments whatsoever from the contractor. They, too, may consider the contractor a man of fine repute. However, these suppliers know, what the builder does not generally know, that they can go behind the contractor to effect collection. Death of the contractor will not deter suppliers and mechanics from slapping liens on the job if, with the contractor's death and terminated earning power, it develops his estate is insufficient to satisfy his indebtedness.

Bone Fixation with Sleeve Kits

By RAYMOND J. GARBUTT, D.V.M.
New York, New York

OUR work with sleeve kits for fracture repair goes back about two years. During this period we worked out a technic using tubes of stainless steel, formula 18-8-SMO. We have used these sleeves in the humerus, femur and tibia.

Method of Preparing Sleeves

A number of sleeves are cut from stainless steel tubing. They vary in length from 1½ inches to four inches. It is extremely difficult to cut stainless steel. The hardness of the metal rips out teeth from hacksaw blades and dulls the edges of files and cutting tools. With the aid of a block of wood, a good vise, brace and bit, a wood holding block may be made. Holes slightly larger than the tubes are made in the wooden block. The block is then cut into halves parallel to the holes. Tubes can be placed in the holes and then the block squeezed between the jaws of the vise (Fig. 1).

This method of holding permits simple cutting with hacksaw, file or tube cutter. If any considerable quantity of sleeves are to be made, pinching one end of tube in the jaws of a vise and then cutting off sections will prove satisfactory. It is much faster than working with a file or hacksaw. There is a little more waste with this measure as the short ends will be flattened and discarded in most instances. If these flattened ends are long enough to be usable, it is possible to save some of them. The ends are placed over a hole in a piece of wood. A drift pin* is then driven through the tube end. This process is continued using several sizes of drift pins or rods until sleeve approaches its original shape.

Sleeves when placed in the medullary canal must move freely up and down. Just simply cutting a section of tube and placing it in the canal will not give uniform results. After trying numerous ways of moving the sleeve up and down in the canal, we made up stainless steel wires with a loop on one end (Fig. 1). We call these guide wires. They are made by winding one end of a wire around a nail or smooth pin. After six or seven complete turns around the nail the long end is run through the loops and pulled tight. Sometimes in order to strengthen the sleeves we have inserted a piece of solid rod of stainless steel. The insert is held in place in the sleeve by means of the loops. This assembly we called, for want of a better name, a "sleeve kit."

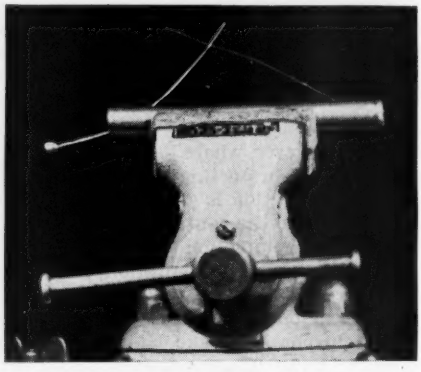


Fig. 1. One guide wire has been pulled tight. Note loop on other guide wire.

Fig. 2. Note how guide wires are crossed.

Insertion of Guide Wires

Holes at each end of the sleeve should be drilled for guide wire insertion. These holes are made about ⅜-inch from the cut ends of each tube and must be lined up correctly (Fig. 2).

For holding the sleeves for drilling a good vise is necessary. The jaws should be covered with lead, or a wood block with a cut-out for

* Somewhat similar to a punch only made with a long uniform shaft and tapered shoulder.

the holding of the sleeve provided. The lead-lined jaws or block is a must; otherwise the sleeve may be squeezed out of shape. It is best after the sleeve is in the vise to run a piece of wood dowel through it to stiffen it for center punching and drilling. After the center punch hole is made, drilling should be done with an electric drill. A hand operated drill may be used but it is slow. A rheostat should be used with electric drilling so as to cut down the speed. If the drill runs too fast, the twist drills will simply burn out. When the holes are completed the guide wires should be placed in the holes. This is done by inserting the long end of the wire in the hole through the lumen of the sleeve so that the loop is pulled up against the lumen wall of the sleeve. With both wires pulled through, the sleeve is ready for use after sterilization.

Fig. 3. Upper middle third fracture of femur in a nine-year old Boxer.

Fig. 4. Fixation with sleeve kit. guide wires are in sleeve but unfortunately do not show.

Determining Size of Sleeve Needed

The x-ray should be placed in the viewing screen. The longer fragment should be measured with any ordinary ruler or a piece of tube. The sleeve should be about 2/3rds the length of the long fragment. The diameter is determined by placing different diameter sleeves over the medullary canal of the frag-

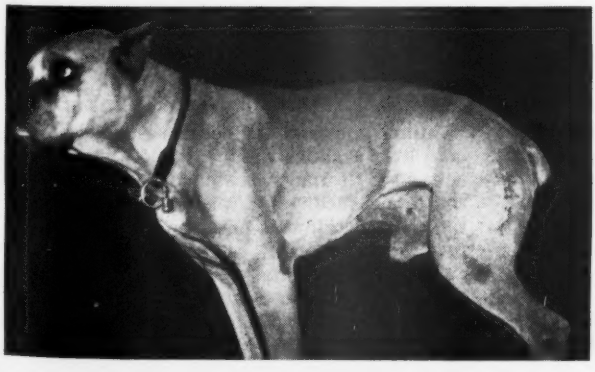


Fig. 5. Patient as he appeared 14 days after operation.

ment. At the usual distance from tube to object, usually 36 inches, there is a slight increase in size, both length and diameter, of the bones recorded on the *x*-ray. To be on the safe side the sleeve should be a little smaller in diameter and a little shorter in length than what the radiograph seems to indicate (Fig. 4).

Skin Preparation

The hair is clipped over the operative field 24 to 48 hours before the time set for operating. The area is well scrubbed with soap and water and a standard antiseptic solution is applied. A sterile stockinette is then pulled up over the limb and held there until the patient is ready for operating.

Stretching the Femur

The amount of stretching depends on the type of fracture and the period elapsed since the break occurred. Fresh fractures may be stretched from 10 to 15 minutes; old fractures may require from one to two hours. When stretching is completed the operative area is then cleaned up, the area surrounding properly draped and the patient readied for the operation.

Anesthesia

In the average case we use atropine and morphine followed by nembutal.

Site of Incision

For a fractured femur we make an incision through skin and muscles over the area where the femur normally lies. We cut through the skin and then carefully through the muscle down to the cavity caused by the sharp ends of the fragments.

The end of each fragment is exposed and a small hole is drilled in each fragment about one-half inch from the broken end and as near opposite as is possible. The medullary canal is then reamed out and the sleeve inserted. The guide wires are placed in the proper holes, the sleeve worked into position in the canal and the ends of wires twisted together and then cut off (Fig. 2.). If much hemorrhage has occurred two or three pieces of gelfoam may be placed in the wound and sprinkled over with about 5cc solution 100,000 units of penicillin. The muscles are brought together with No. 1 catgut, interrupted sutures and the skin is closed with mattress sutures using a nonabsorbable material such as dermalon. The patient is given about 100,000 units of penicillin daily for three, or four days and the skin stitches are removed about the seventh day to 14th day. Up to date, this method of fracture repair, using sleeve kits, has given good results.

Do not bandage a cat after spaying, cesarean section or other abdominal operation. Use a minimum dressing retained by short strips of adhesive.—E. A. DAVIS.

Removal of Needle from a Cat

A kitten, six months of age, was brought to the hospital with a history of having swallowed a needle and persistent vomiting. A radiograph located the needle lodged in the thoracic portion of the esophagus. Nembutal anesthesia,. laparotomy and incision of the stomach wall followed. A thread was visible. Gentle traction brought the needle into stomach, simplifying its removal. An uneventful recovery ensued.—S. W. STILES in *The Maine Veterinarian.*

Raw Meat and Milk Essential to Cats

That raw meat is essential to the well-being and reproduction of cats is shown by a 10-year series of dietary experiments. Cats fed on raw meat and raw milk rarely died except from fighting or old age. They kept their health from generation to generation, reproducing normally and caring for their young normally.

But with cats fed on cooked meat and processed milk, it was a very different story.

These cats developed sinister degenerative diseases. From generation to generation, the skeletal structure went from bad to worse. By the fourth generation, cats eating only processed foods were unable to reproduce. And death, in most cases due to infectious disease, resulted.—FRANCES M. POTTENGER, JR., M.D.

Cost of Animal Disease

Not enough is being done to protect the millions of citizens who suffer economically and physically through diseases of animals.

Protection of society against infections transmissible from animals to man is a recognized function of government—part of a national health program. Nevertheless, just about all the government can do is to handle administrative details of the project, and its success will depend almost entirely upon the joint efforts of veterinary practitioners and animal owners.

Animal diseases will continue to plague human lives and destroy foods and animal products vital to man's existence until preventive veterinary medicine is made to work successfully on a worldwide basis.

Great strides have been made in developing curative treatments for animal diseases but the very fact that treatment is necessary is a tacit admission that prevention has failed.—K. F. MEYER, D.V.M., M.D.

Extraction of Teeth in Small Animals

By ALVIN D. KAPLAN, B.A., D.V.M.
Arlington, Massachusetts

TOOTH extraction, although quite often passed off as a minor surgical operation in the practice of veterinary medicine, is nevertheless, a procedure that very frequently presents grave difficulties. This surgical procedure is often performed by the veterinarian in small animal practice just as a matter of course with little preparation. To remove teeth successfully requires an understanding of the anatomy, physiology, and histology of such structures, as well as those in direct contact with them. Under dental anatomy one includes a part of the organic structure which is in direct relationship to the head bones, especially the jaws, origin and distribution of nerves and vessels which supply all the dental tissues, and a knowledge of muscles concerned in moving the lower jaw. Tooth extraction is not merely a job of pulling teeth.

Since teeth are of dermal origin, being dermal appendages and comparable to hair and nails, they are not of the osseous system. They are strongly attached, well inserted in bone sockets. Three hard structures constitute their make up; enamel, cementum and dentin which should be well understood in regard to origination and development.

The enamel, of ectoderm derivation, covering the crown or exposed portion of tooth, is non-regenerated and is the hardest body tissue. It is made up of prisms or enamel rods, and cement or interprismatic substance, which binds the rods together.

The dentin, of mesoderm derivation, makes up the body of the tooth and really determines its form. Its structural elements are tubules or minute canals which radiate from a central pulp containing cavity, and intertubular substance.

The cementum, which covers the tooth root and incloses dentin, at the gingival border or tooth neck, slightly overlapping the enamel, is a variety of bone tissue, without, however, the haversian canals found in bone. Cementum contains canaliculi and lacunae similar to bone. This root covering is made up of parallel lamellae of bone tissue, small vessels penetrating these plates, while other vessels, of pulp derivation, pass through the cementum in the opposite direction. From the pericemental membrane, which lines the alveolar cavity, and so invests the tooth root, fibers are firmly attached to the cementum and furnish an excellent medium of connection by which the tooth is firmly held in its alveolar cavity. These fibers well account for the great resistance offered by the tooth to its removal.

The pericemental membrane is made up of fibroblasts, osteoblasts, osteoclasts, and epithelial cells. All the fibers, white and inelastic, are formed by the fibroblasts and extend into the cementum in a transverse direction, being attached to root cementum and alveolar cavity bony wall, thus supporting the tooth in place.

The fibrous tissue is of two types, one of which is coarse, radiating and bulky and so secures the tooth; the second is fine and interlaces the coarser, being connected with the permeating blood vessels of the tissue. From the cementum gingival portion, some fibers of the membrane pass to the adjoining tooth membrane while others enter the adjacent mucous membrane connective tissue, thus giving gum hardness. The pericemental membrane is well supplied by way of three blood systems; those entering near the root apex, others from the haversian canals, and the third is derived from the gum mucous membrane near the gingival border.

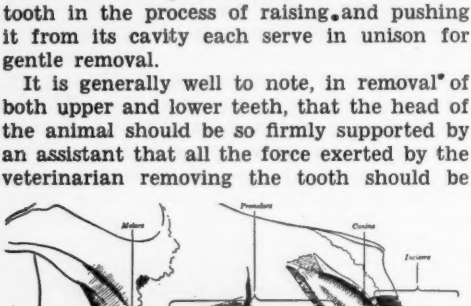
Each tooth is attached by insertion into a well-developed cavity or alveolus which is made up of compact bone tissue surrounded by cancellated or spongy tissue, which acts as a good cushion against physical shocks sustained by the teeth.

In tooth extraction we can easily divide the process into four distinct procedures; the careful examination for determining both the condition and location of the bad tooth, placing the animal under excellent restraint (anesthesia, local or general), selecting a proper instrument or instruments for removal of the affected tooth and setting the direction in which the force may best be applied in the line of least resistance.

The selection of the best available instrument for the tooth to be extracted is most important so that the application of these forceps may secure a firm hold about the neck of the tooth with the edges of the beaks of the instrument forced between the tooth and the margins of the alveolus thus opening the orifice a bit and facilitating a more easy removal. The required degree of force may best be applied for loosening the pericemental attachment of the tooth within its alveolar cavity so that the entire tooth may be carefully removed from its socket. This force should be applied in a steady and firm way

to prevent injury to the adjacent tooth, jaws, or any of the surrounding soft tissues. Thus, as in the practice of human dentistry, it should be remembered that the application of three forces is generally regarded as absolutely necessary in the extracting operation, traction, rotation, and pressure. Traction, the drawing force; rotation, the turning around on an axis and pressure, the force used on a tooth in the process of raising and pushing it from its cavity each serve in unison for gentle removal.

It is generally well to note, in removal of both upper and lower teeth, that the head of the animal should be so firmly supported by an assistant that all the force exerted by the veterinarian removing the tooth should be



The permanent teeth.*

borne only by the tooth in question, and this force be so readily controlled as to prevent injury, either to adjoining teeth or to those in opposite jaw, if the extracted tooth suddenly leaves its socket.

For the actual extraction the veterinarian may employ forceps and elevators. In difficult cases the chisel and small dental hammer have been very useful. There are special forms of dental forceps adopted to the different classes of teeth, but as a general rule four different shaped forceps; canine molar extractor, incisor premolar extractor, molar splitter or separator, and a root extractor, will suffice in small animal dentistry. After some experience one can easily apply a forceps whose beak is so curved as to overreach the tooth crown when the edge of the beak is applied to the neck and so avoid a fracture of the crown. It is always advantageous to have a thin sharp beak whose edges may be introduced between the gum margin and the thin walls of the alveolar orifice.

The procedure of applying and using the dental forceps may be summarized as follows: The forceps is firmly grasped in the right hand with the palm of the hand inward and the thumb on the top, with its ball pressed between the handles in the bifurcation, with such force as will regulate and limit the pressure of the beaks after their edges are applied to the tooth portion at the neck to be grasped. By using the ball of the thumb in the manner described an increase of the pressure, to a greater degree than necessary, on the tooth may be avoided without incurring the danger of crushing it. The first or second fingers of the hand holding the forceps should be inserted between the handles near the bifurcation, and used for separating the beaks. The little finger of the right hand may be applied to the end at the extremity of the outer handle of the forceps and so prevent slipping. At all times the inner beak of a forceps should be placed in position first, when applying it to the neck of a tooth, then carefully place the outer beak, for the crown is easily fractured by careless contact with the forceps. After the beaks are applied to the neck they should not be pressed together more firmly or tightly than is absolutely necessary for securing and maintaining a very firm hold. Once the tooth is held it is a matter of patience and careful procedure to break its attachment in its alveolar cavity by rotation or the outward and inward motions according to the class of tooth.

Roughly considering the different classes of canine teeth, a few rules may be formulated for their removal with the dental forceps. Upper incisors require the loosening force first be applied in the direction of a line drawn through the greatest axis of the tooth at the same time using rotating force. Best pressure or pull should be labial and not lingual. The upper canine, being large, conical, and curved is separated from the corner incisor by a small interval. It offers the greatest resistance with its one inch root well embedded and attached in a bony alveolus. The rotation movement is most important here and the pulling force is a line parallel to the long axis. Often the use of the elevator is well rewarded in canine tooth extraction.

The first premolar, having a single root, is easily loosened by simple rotary movements and then traction. On the remaining premolars, having more than one root, traction is generally applied, in a lingual direction rather than in the buccal direction. Once slightly loosened the rotary motion may be resorted to completely displace the tooth. For the removal of the upper two molars, traction must be applied first in a buccal direction

*Illustration from 5th edition of Topographical Anatomy of the Dog, by O. C. Bradley, revised by T. Grahame. By permission of Macmillan, publisher.

according to the outward inclination of the tooth, for the single deeper lingual root offers first resistance. When it is loosened, after a short impressive traction pull, the other two smaller roots follow suit and a rotary movement will completely remove the offender. In all teeth of the upper jaw care must be used in the amount of force exerted outwardly because of the thin alveolus wall of the buccal surface which is easily fractured.

The lower teeth are generally more difficult to extract than the upper, especially since the lower jaw is movable and necessitates as much immobilization an assistant and the operator can apply. Similar procedure in extracting may be used with the lower teeth as is performed on the upper, except that more care must be used, and whenever necessary, the correct modification. At all times caution should be taken when applying the forceps that no part of the tongue be inclosed between the beaks of the forceps and the roots.

Deciduous tooth extraction, when necessary, often requires only little force or effort and can be performed with smaller and fewer instruments. Small special forceps may be used or just the smaller beak forceps of the permanent tooth instruments, especially root forceps. However, there are those rare occasions when the persistant presence of the temporary canines besides the already well shaped permanents present the problem of removal or loosening without injuring the latter.

It often becomes necessary for the veterinarian, not skilled in the removal of whole teeth, to extract firmly implanted roots that separated from the crowns when an attempt was made to extract the entire tooth. Here great difficulty is often encountered, and to such a degree as to make it absolutely necessary that special instruments be resorted to. Root forceps, with long slender beaks not adapted for application of great force, and elevators are such especially designed instruments. In working with an elevator, care always should be observed that it doesn't slip and wound the soft tissue of the mouth. The adjoining tooth or root or the thumb of the hand of the operator may be used as a fulcrum. The elevator may also be used to loosen firmly implanted teeth as well as roots by simply inserting the point of the blade of the elevator between either the root or tooth to be removed and the adjoining tooth or root, and by a slight rotary motion the root or tooth is lifted from its cavity.

Careful consideration of procedures to follow must always precede the actual removal of a tooth. Each case presents its own problem. Only recently I was called upon to remove a root of a canine tooth that had been broken off at play. The animal, a Boxer, was easy to handle and after a closer examination all that could be seen of the broken tooth was a sharp piece, about ⅛ inch long, protruding above the gum line. To attempt removal by mere grasping what was projecting was foolhardy, so that a flap method procedure was advised. Since perfect restraint was necessary for such surgery intravenous pentobarbital was administered to effect. With a very sharp gum lancet a semicircular incision was made between the first premolar and the affected tooth. Once the gum was loosened it was a tedious task to slowly chisel underneath this gum flap so that a rat tooth forceps applied to the tip of the flap easily pulled it over and so exposed the alveolus of the root to be removed. The chisel used with a dental hammer was then worked to break down the pericemental membrane holding the root in the socket, as well as remove part of the alveolus wall process. The narrow beaks of a suitable pair of dental forceps were then worked down as far as possible so as to grasp the small remaining part of the crown, and gradually, with a twisting motion and a forward pull, the tooth came loose and was removed. After the regular application of penicillin, the flap was turned back to its original position and held by one suture.

The splitting of teeth, especially the carnassial teeth whose roots tend to diverge rather greatly from the neck, is rather helpful and necessary when it is quite evident that mere force is of no avail in the extraction of the tooth. The sharp edges of the splitting or separating forceps are carried down over the crown to the very small space between the roots, and using the correct amount of force the crown is divided at the center of the lingual and buccal surfaces. The separated roots are removed by using a pair of root forceps.

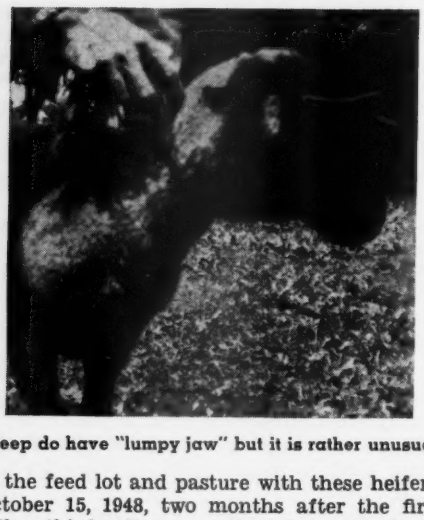
Under normal conditions, and if performed along scientific principles, tooth-extraction is not a difficult operation. Many cases are often presented, where, due to abnormal conditions, a great deal of judgment and skill are required. A very tender regard for the physical suffering of the patient, on the part of the veterinarian, will in most all cases so affect the animal that it will more easily submit to treatment. It is more advantageous to do the operation slowly in order to do it well. The hand should never make any movement with the forceps more rapidly than the eye can follow, for physical injury may result.

Clinical Reports

Actinobacillosis of Sheep

A call was received on August 16, 1948, from a farm in south central Kansas to treat two of a herd of 12 purebred Shorthorn heifers for "lumpy jaw." They were given 250cc of a 12% solution of sodium iodide, intravenously. Two weeks later, another call came from the same farm to treat two more heifers which were drooling, losing weight, and acting like they could not swallow. On examination a diagnosis of actinobacillosis or wooden tongue was made. These animals were treated with sodium iodide and recovery was uneventful.

There were 60 head of purebred Suffolk ewes



Sheep do have "lumpy jaw" but it is rather unusual.

in the feed lot and pasture with these heifers. October 15, 1948, two months after the first call, a third call was received from this farm. The owner asked, "Do sheep have 'lumpy' jaw?" He was informed that sheep could have "lumpy jaw," but it was unusual. Another trip to this farm revealed several of the sheep showing enlargement in the region of the mandible. Of the 60 ewes, 24 had one or more lesions in the subcutaneous tissue along the lower border of the mandible. Upon incision of the nodules in five different ewes, a mucoid, nonodorous, greenish-white pus escaped.

This pus was washed with normal saline solution removing the pus and leaving small sulfur-like granules. The granules were placed between two slides to flatten them out for microscopic examination. Rosettes of radiating clubs were plainly visible. Some more pus was washed and the granules placed on a slide and stained with Gram's stain. A microscopic examination showed small, gram-negative rods. This, together with the appearance of the pus, confirmed a diagnosis of actinobacillosis.

The affected sheep were segregated from the remainder of the flock and placed on iodine treatment, consisting of one teaspoonful of hexamethylene tetramine tetraiodide on the grain, once daily for eight days. The unaffected sheep were placed in another pasture where contact with the affected ones was impossible. After two weeks the 24 head under treatment were again examined and only eight showed lesions. They were given 25cc each of 12% solution of sodium iodide intravenously. Two weeks later only two ewes still showed lesions and the intravenous sodium iodide treatment was repeated. Uneventful recovery followed. Since December 4, 1948, when the last infected sheep were treated, with subsequent recovery, no further cases have appeared in the flock.

DALE MARTIN, D.V.M.

Halstead, Kans.

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Prolapse of the Rectum, Bladder, Vagina and Uterus in a Sow

In the mid-afternoon of March 17, 1949 a one-year-old Duroc sow, in fair condition, was presented for treatment. The sow had a prolapse of the rectum, bladder, vagina and also a partial prolapse of the uterus to the extent that it nearly dragged on the ground when she walked. This sow had farrowed 10 days previously and had lain on the four pigs in the litter soon after they were born. The pigs had been of average size at birth.

The prolapse of the rectum had occurred the first day after farrowing. Sloughing was taking place in the prolapsed portion. The irritation resulting from the prolapsed rectum caused considerable straining. On the eighth day after farrowing, a prolapse of the vagina occurred. The severity of the straining was increased and a partial prolapse of the uterus soon followed. When the sow was presented for treatment the prolapsed portion of the uterus was so edematous that it was nearly five inches in diameter.

On the ninth day after farrowing the ventral attachment of the prolapsed rectum gave way due to necrosis and sloughing of the tissue. A partial prolapse of the bladder occurred through this opening ventral to the prolapsed rectum; temperature was 102.4°F.

The sow was secured by a rope around the snout and upper jaw posterior to the canine teeth. The resulting struggle brought on a complete prolapse of the bladder.

Approximately three pints of urine were drained out of the bladder by puncturing it with a 16-gauge, three-inch needle. Local an-

esthesia was produced in the area by infiltrating the skin around the anus and vulva with 1% procaine hydrochloride solution. The prolapsed organs and surrounding area was cleaned as well as possible with 1% chlorazene solution and cotton swabs.

The collapsed bladder was replaced without much difficulty and a purse string suture of ¼-inch umbilical tape placed around the anus to prevent the bladder from again being forced out by straining.

A purse string was placed well back from the vulva in the skin around the vulva. This was done before the uterus was replaced so a reprolapse could be prevented by tightening the purse string after replacing the organ, thus reducing traumatism from handling to a minimum. Some difficulty was experienced in replacing the uterus, due to its size, but with persistent steady pressure this was successfully accomplished.

Due to the degree of necrosis the prolapsed portion of the rectum was easily separated from the body. The edge of the surrounding skin was freshened by trimming away the necrotic tissue. Tension was applied to the rectum until a sufficient amount was pulled out to expose what appeared to be normal tissue. The rectum was then split longitudinally on the dorsal side back to the apparently normal tissue. Interrupted mattress sutures of linen were used to suture the normal rectal tissue to the skin from which the necrotic tissue had been trimmed. When sutures had been placed around the circumference of the rectum it was cut off about three-eights of an inch posterior to the sutures. The anal sphincter was evidently included in the necrotic portion which was amputated as the passage of feces was almost constant after healing had occurred.

The sow drank water immediately after the operation but was given no feed until the following day when she was fed some bran. She ate and drank and improved in condition for four days after the operation. On the fifth post-operative day she ate but little. Her temperature was not taken since she was rather surly and it was thought best not to disturb her unless absolutely necessary. On the sixth day she ate nothing and drank only a little water. She appeared very gaunt.

The next day her temperature was taken with difficulty and was only 101.8°F. She ate nothing during the day and appeared to be greatly dehydrated. She was given 200mg of thiamine hydrochloride intramuscularly. The following day she ate a little. On the ninth day after the operation her appetite was much improved.

The thiamine may or may not have had a beneficial affect in stimulating the appetite in this case, however, thiamine is commonly used to stimulate the appetite in human and canine patients.

By the 14th day, when the sutures were removed she was apparently in good health and gaining weight.

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Congenital Protrusions of the Membrana Nictitans with Adhesions

The degree to which the condition had developed in this case is rarely seen, making it interesting and in my opinion worthy of report.

History.—A black Cocker Spaniel, two years of age, was brought to the clinic with its left eyeball completely hidden by a mucous membrane. This condition had existed since birth.

There were two black pigmented areas on the membrana nictitans.

There was no abnormal exudate nor sensitiveness of the eye. The upper and lower eyelids were normal. The condition had been diagnosed as anophthalmia, or the absence of the eye. The membrane contained two black pigmented areas of approximately equal size, which covered about two-thirds of the area; the remainder being normal colored mucous membrane. There was a slight depression, one millimeter in diameter, near the lateral canthus. Otherwise the membrane appeared smooth and complete. The condition was diagnosed as a congenital protrusion of the membrana nictitans with adhesions. An unfavorable prognosis was given as to the eventual function of the affected eye. The owner de-

sired surgical treatment, however, on the chance that the operation might give a better appearance to the dog.

Operation.—General anesthesia was induced with sodium pentobarbital and the animal was restrained in lateral recumbency on the operating table. The eyelids were retracted as far as possible so that the entire membrane was exposed. With aseptic precautions, dissection was begun with a pointed scalpel and a pair of forceps at the depression near the lateral canthus. This depression proved to be the only area over which the membrane was not adherent. It extended to the cornea. After considerable dissection the cornea was exposed. It appeared small and atrophied (approximately one-half its normal size), dull and lusterless, of deep bluish black or purplish. The membrane was adhered to the cornea, and seemed continuous with the entire conjunctiva at the periphery of the cornea. A small pair of scissors was used with the forceps to complete the dissection. The entire membrana nictitans, including the cartilage, was removed. Its average thickness was five to six millimeters. Near completion of the operation, the aqueous humor was accidently released from the anterior chamber of the eye. Saline packs were applied frequently to control hemorrhage.

Aftercare.—On completion of the operation the conjunctival sac was filled with 5% sulfathiazole ointment, covered with a gauze pack and bandaged.

Five percent sulfathiazole ointment dressings were renewed daily for two days. On the third day the bandage was removed and the dog discharged with directions to the owner to apply hot packs to the eye three times daily, follow with an application of sulfathiazole ointment. The owner was advised to return the animal after two weeks for further observation.

At the end of the two weeks the conjunctiva of the lower lid had adhered to the cornea and had again completely covered the eye. The appearance was almost identical to the former membrana nictitans except for the absence of the two pigmented areas.

The owner was given the choice of the two alternatives—complete removal of the eye or to let the condition remain as it was. Understandably he chose the latter.

Conclusion.—The chances for success in correcting the condition would have undoubtedly been greater had the operation been performed when the puppy was only a few days or weeks old. The eye would not have been atrophied from disuse to such an extent and there would have been less chance of the re-formation of adhesions after they had once been removed. The treatment was undertaken with the owner's full understanding of the slight chance of success. The real interest of the case lies in the fact that a condition such as this does occur, though rarely. The report may be of some benefit to other veterinarians faced with a like problem.

JOHN AITKEN, D.V.M.
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Diverticula in the Small Intestine of a Steer

Diverticula of the small intestine is apparently a rare anomaly of the animal digestive system. If not rare it seems that it has not been associated with pathological conditions in veterinary medicine. When the condition appeared on a post-mortem examination recently, it was viewed with much interest by members of the veterinary faculty at Kansas

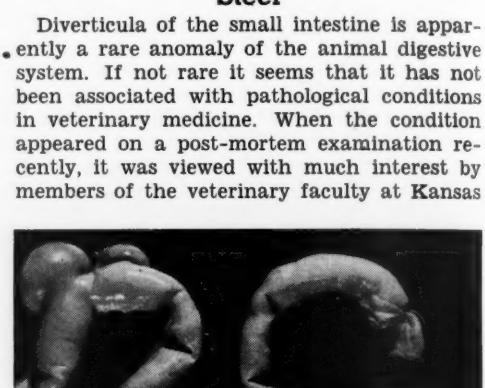

Fig. 1. Diverticula varied greatly in size.

State College. It had not been noted previously at this institution and when the works of several veterinary pathologists were investigated no reference to this condition was found.

Bell, MacCallum, Boyd, Moore, and others describe the condition in man, where it seems to be quite common and nonpathogenic unless infected. Bell[1] states that in his post-mortem records there was one instance of death from diverticulitis of the small intestine. Bell further states that the condition is not congenital in humans and that constipation is a factor in the etiology. Other writers disagree with him on the latter point, however. Moore[2] confirms Bell's statement and also concurs that it is a condition of later middle age. The intestinal musculature parts at its weak-

[1] Bell, E. T., Test Book of Pathology.
[2] Moore, R. A., Text Book of Pathology.

est point and the mucosa evaginates through the opening.

History.—In August 1947, the owner of the animal having the condition in question, inspected his cattle in the pasture. All of them seemed to be doing well except one steer, which was in poor flesh and did not look thrifty. It was supposed that this animal belonged to some one else as it didn't seem to fit in with his herd. When the herd was brought into the feed lot in the late fall, the unthrifty steer was left behind. Upon counting his cattle on arrival at the yard it was found that a mistake had been made and one animal was missing. It was then discovered that the misfit actually belonged to this owner and he was reclaimed. The cattle were wintered on prairie hay and alfalfa and all made steady gains except this poor doing animal.

This steer, a yearling Hereford, had been down two days before being brought to the veterinary hospital at Kansas State College, February 14, 1948. It was quite emaciated, weighing only about 500 pounds. The hair coat was rough, and the skin, although not extremely tight, did not have the pliability of that of a healthy animal. The feces were normal and the appetite good.

Symptoms.—Diagnosis was withheld and the animal placed under observation. A blood count gave the following results: erythrocytes, 4,850,000; leucocytes, 6,700; eosinophiles, 2; basophiles, 0; myelocytes, 0; juveniles, 0; stabs, 1; segmenters, 31; lymphocytes (large, 2; atypical, 15; small, 47) 64; monocytes 2; hemoglobin 8gm. This hemogram is essentially normal.

A fecal examination showed the presence of *Haemonchus contortus* but the parasites were not evident clinically.

February 17, 1948 an intravenous injection of 500cc of dextrose was given. No other treatment had been administered. The patient died the afternoon of the 17th.

Post-mortem findings showed considerable edema prevalent throughout the extremities and ventral abdominal wall. The heart was apparently normal, though some edema was found in the fatty tissue surrounding the organ. The spleen also appeared normal and only one small spot of necrosis about 2.5cm in diameter was found on the liver. The gall bladder showed a marked choleocystitis and the lungs contained one area of congestion about 8cm in diameter on the tip of the diaphragmatic lobe. The rest of the lung appeared normal as did the rumen, reticulum, omasum, and abomasum.

The small intestine presented the condition under discussion. The mucosa was thickly covered with a clear gelatinous, catarrhal exudate. Diverticula, (Fig. 1) varying in size from that of a garden pea to nearly that of a tennis ball, were found along the full length of the intestine. They all appeared on the side opposite the mesentery and occurred in no particular pattern. They probably would have averaged six inches apart. Localized areas of submucous hemorrhage were present. Pin point ulcers were noticed sparsely scattered throughout the organ. In several places along the intestine, stenosis appeared just posterior to the saclike diverticula.

A section was taken from one of the smaller diverticula and upon microscopic examination a rupture of both the circular and longitudinal muscle layers was revealed, with an evagination of the mucosa. No microscopic pathology was noted in this section.

Conclusion

Diagnosis of this condition clinically was impossible without the aid of the x-ray, and under the circumstances such procedure did not seem to be indicated. The actual cause of death is still somewhat in doubt, although considering the emaciated condition of the animal, it is possible that the presence of the catarrhal exudate was sufficient to prevent absorption of nutrients to the extent of starvation. Whether the diverticula were conducive to the production of the exudate or were merely incidental has not been determined.

GLENN REA, D.V.M.
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Scrotal Hernia Rare in Mink

Although hernias are often seen in other domestic animals, particularly pigs, they rarely appear in ranch-raised mink.

While visiting a mink ranch in the vicinity of Petersburg, Alaska, we were shown a young male Black Cross mutation mink kitten. The animal was approximately two months old. The most significant feature shown by the mink was a funnel shaped swelling in the right inguinal region. An examination showed it to be a scrotal hernia.

Dr. A. D. Lloyd, Tillamook, Oregon has successfully operated on a male Silver Blu mutation that was similarly affected. The animal was used for breeding purposes the following season with no loss in breeding efficiency. Dr. Lloyd has since reported seeing two additional cases.

If the animal is a valuable breeder, an operation is justified. If, however, it is to be pelted in season, surgical procedures are probably not warranted.—*Am. Nat'l Fur & Market Jour.*

Complete Congenital Atresia of the Nasolacrimal Duct of a Horse

Sisson tells us that the lacrimal apparatus is made up of the lacrimal gland, which secretes the clear lacrimal fluid; the excretory ducts of the gland; the two lacrimal ducts or canaliculi; lacrimal sac and nasolacrimal duct.

The puncta lacrimalia are the entrances to the two lacrimal ducts. Each is a fine, slit-like aperture situated close behind the free edge of the lid about one-third inch from the medial canthus. The lacrimal ducts, upper and lower, begin at the puncta and converge at the medial commissure to open into the lacrimal sac. The latter may be regarded as the dilated origin of the nasolacrimal duct. It occupies the funnel-like origin of the bony lacrimal canal, which is termed the fossa of the lacrimal sac; and leads to the nasolacrimal duct, which passes forward and a little downward along the outer wall of the frontal sinus and the nasal cavity and opens near the lower commissure of the nostril. Its length in the horse is about twelve inches. In the first part of its course it is enclosed in the osseous lacrimal canal; farther forward it lies in the lacrimal groove of the maxilla, covered at first by a plate of cartilage and then by the mucous membrane of the middle meatus. The terminal part lies in the ventral turbinate fold and opens onto the skin of the floor of the nostril near the transition from skin to mucous membrane. Accessory openings may occur a little farther back.

Maximow and Bloom state that the function of the lacrimal apparatus is to moisten, lubricate and flush the surface of the eyeball and of the lids.

May 5, 1949, a brown draft mare was brought into the hospital showing a mucopurulent discharge from both eyes. This mare was one year of age and had been showing this discharge for some time. The temperature was normal. She seemed to be in good flesh and the general appearance was that of a normal animal. Further examination revealed an atresia of the nasolacrimal duct.

The horse was restrained on the large animal operating table, a blunt-end hypodermic needle inserted through the puncta lacrimalia into the lacrimal sac and 10cc of aqueous roccal solution, forced through the lacrimal duct. When this was done, it was obvious that there was an occlusion of the duct near the junction of the mucous membrane and the skin on the ventral floor of the nostril because there was a definite raised area where the lower opening of the nasolacrimal duct should be. The area around this raised area was infiltrated with a 2% solution of procaine. An incision about one inch long was made through the skin and subcutaneous tissue into the lower end of the nasolacrimal duct. A double linen suture was placed through the skin a little ventral to this incision. A silver wire about six inches long was doubled and passed through the incision at the lower end of the nasolacrimal duct and upward into the duct and made secure by tieing it to the suture through the skin. In this manner it is not likely that the wire suture material will drop out before healing takes place at the ventral end of the duct. The owner was advised to allow the wire to remain *in situ* for 10 days and then return the animal for a check-up.

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Cervical Spondylitis in a Dog

A seven year old male, black and white smooth-haired Fox Terrier was admitted to the clinic with a history of stiffness and a staggering gait. A tentative diagnosis of an abscess in the neck had been made a few days previously.

On careful examination, it was noted that the dog held his head in an extended manner and could not be induced to turn it in any direction. The brachiocephalicus, the sternohyoideus and the sternothyroideus muscles appeared slightly swollen. There was a conjunctivitis of the right eye and the temperature was normal. Definite signs of pain and distress were shown upon palpatation of the cervical area.

A history of sudden onset without injury was given by the owner.

A tentative diagnosis of spondylitis of the cervical vertebrae was made. This was confirmed by *x*-ray examination which showed a spondylitis of the fourth and fifth cervical vertebrae.

A guarded prognosis was given and the dog was hospitalized for treatment. On the first day, 100,000 units of penicillin hypodermically and five grains of sodium salycilate *per os*, were given. This treatment was repeated the second day. At no time was there any change in temperature. On the third day the dog was given 10 grains of acetylsalicylic acid twice a day. At the end of five days' treatment marked improvement was noted and the dog was discharged. The owner was instructed to give the dog five grains of the acetylsalicylic acid twice daily until recovery.

Three months later, February 1949, the owner reported the dog seemed perfectly normal and had put on weight.

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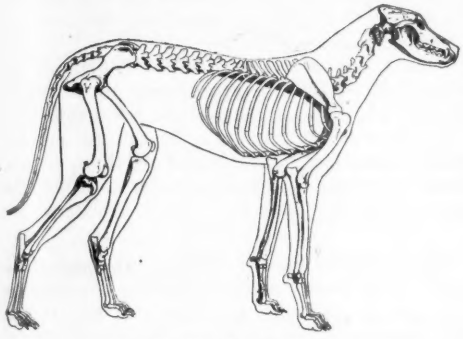
Book Reviews

Topographical Anatomy of the Dog. By *O. Charock Bradley,* M.D., D. Sc., F.R.C.V.S., revised by *Tom Graham,* T.D., F.R.C.V.S., Professor of Anatomy, Royal (Dick) Veterinary College, Edinburgh, Lecturer on Comparative Anatomy, University of Edinburgh. Fifth edition, 299 pages, 15 plates, 128 illustrations. MacMillan Company, New York, publisher's American representative, 1948. Price $7.00.

As the title implies this book treats anatomy in body regions rather than by systems. Without benefit of preliminary discussion, introduction or explanation of terminology the author sails into the subject at hand beginning by saying that the dissection of the dog



Skeleton of a Dog.*

is best begun with the animal lying on its back. From this position anatomical structures are discussed as they are reached by careful dissection through the abdomen and hence to adjacent body regions. Because of this organization of text material one must locate the page or pages devoted to tne discussion of the regional anatomy to locate any particular structure. There are no chapter divisions of the text material which progresses from region to adjacent region in a continuous fashion. The complete index, however, overcomes some disadvantages of the text organization for a reference work. For example, if desired the entire course of a nerve may be found by reference to the index giving page number or numbers guiding the reference reader to discussions of the nerve through one or more body regions.

Essentially the book is intended to be a simple guide to the dissection of the dog for the student beginning his professional course. Actually it is more. Nevertheless a cadaver at hand would help to clarify the statements while reading.

Plates referred to include largely excellent reproductions of *x*-ray films of deep structures in their natural relationship. Text illustrations are well drawn sketches showing parts in opened regions that are exhaustively captioned. Drawings of bones on which areas of muscular attachments are shaded aid in the understanding of muscular and ligamentous attachments and insertions.

Tables giving branches of principal arteries and nerves are appended.

This work will serve well the needs of both student and practitioner.

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Diseases and Parasites of Poultry, by *Edgar Hugh Barger,* D.V.M., formerly, Pathologist, Illinois State Department of Agriculture, and *Leslie Ellsworth Card,* Ph.D., Professor of Animal Science, University of Illinois. Fourth edition, revised, 400 pages, 77 illustrations. Published by Lea & Febiger, Philadelphia. 1949. Price $4.00.

This volume is not, nor were earlier editions, intended for the use of veterinarians; nevertheless, it has been popular with practitioners as a ready reference to salient features of poultry diseases and treatment. No doubt it will continue to serve that useful purpose.

It is stated in the preface, and implied in the foreword, that the purpose of this volume is, "to point the way toward a reduction in mortality among poultry flocks." The attempt is to instruct poultrymen in the intricacies of disease prevention, control and treatment in their flocks. In this, the pointing must have been in the wrong direction, since in 14 years no advance toward that objective has been attained. In this "Poultry Diseases and Parasites" joins hundreds, perhaps thousands of experiment station and extension circulars and bulletins, which have been trying for three-quarters of a century to teach the livestock raiser to handle his own animal disease problems.

Returning to the work under review: The revision has introduced most of the new knowledge developed in the handling of poultry diseases since publication of the third edition, but has not deleted the outmoded discussions. This fault has limited the space available for new material to a degree that renders the treatise inadequate. For example: a long (1½ page) discussion of the use of flowers of sulfur and colloidal sulfur in the treatment of coccidiosis, crowds the consideration of sulfaquinoxaline into 16 lines. Surely in a work of this sort, there is no occasion, in 1949, to devote more than the briefest mention to sulfur as a preventive or treatment

*Frontispiece from book reviewed. Courtesy Macmillan Company.

of coccidiosis. The same fault is noticeable in the references given. Of 79 articles listed under coccidiosis, more than two-thirds antedate 1942 and only 20 are cited which have been published since the sulfa drugs revolutionized the treatment and prevention of this disease.

An excellent discussion of avian pneumoencephalitis is somewhat disappointing because of its brevity and vagueness in the discussion of vaccines for this disease.

Like previous editions, the book is well printed and bound and of presentable appearance throughout. The publisher is commended for holding the price down to practically that of the third edition.

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How to Become a Doctor: A Complete Guide to the Study of Medicine, Dentistry, Pharmacy, Veterinary Medicine, Occupational Therapy, Chiropody and Foot Surgery, Optometry, Hospital Administration, Medical Illustrator, and the Sciences. By *George R. Moon,* A.B., M.A., Examiner and Recorder, University of Illinois, Colleges of Medicine, Dentistry and Pharmacy. 131 pages. Published by The Blakiston Company, Philadelphia, 1949. Price $2.00.

In the hands of the young man or young woman interested in a professional career in any of the medical sciences or subsidiary vocations, this work will perform three functions: (1) By brief descriptions of the advantages and disadvantages, the opportunities and responsibilities and the requirements—physical, mental and temperamental—of the occupations listed, it will assist the young person whose decision is not yet final to decide upon the profession of his choice. (2) By describing the preferred method of handling every detail for gaining admission to a professional school from the selection of electives in high school and college to the application for admission to the professional school which he chooses, and preparation for an interview; this work is designed to give the applicant the best chance of being accepted that circumstances permit. (3) Since the names, locations and matriculation requirements of the schools giving courses leading to a degree in these professions are given, it will enable the prospective student to select more wisely the school to which to apply for admission.

Out of a vast experience, the author attempts to explain the matters that influence the decisions of college registration officials and committees. In passing, it may be said that while good high school and college grades are advantageous, even the best grades are by no means sufficient. Extra-curricular activities, general reading, employment of spare time, financial resources, ambitions, personal appearance, health, leadership, industry, emotional balance, etc., are all considered.

Sample letters, asking for a catalog, requesting information, applying for a registration blank and sample blanks filled out are given, "Since colleges have the habit of filing every tiny item of correspondence from or to each person, the candidate for admission to a medical school should exercise unusual care in all of his contacts with any of the schools. The admissions committee will usually thumb through a student's file and are often influenced by such factors as carelessness or slovenliness in connection with the correspondence."

A complete list of medical, dentistry, veterinary, pharmacal schools, etc., is given with some information concerning each. The discussion of veterinary medicine *per se* is extremely brief but of course the general discussion applies to it as to other divisions of the medical sciences.

Veterinarians are commonly consulted by those contemplating enrollment in a veterinary college and in view of the great difficulty that most applicants have in gaining admission to the veterinary school of their choice, this work can be recommended to them, to improve their chances of being accepted.

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Contriburcao Para a Cirurgia Abdominal do Cao. By *Earnest Antonio Matera,* Faculty of Veterinary Medicine, University of Sao Paulo, Sao Paulo, Brazil; 105 pages illustrated. Published by the author.

This attractive little book is restricted to a study of abdominal incisions in the dog. The author begins his discussion with a quotation from an address by W. F. Guard at the 12th International Veterinary Congress: "In the light of developments in human surgery we must conclude that progress in veterinary surgery has been very slow." He then recounts the many different abdominal incisions employed in human surgery, and states that the literature contains no discussion of comparable abdominal incisions in the dog.

Experimental studies were conducted to determine the advantages and disadvantages of longitudinal, transverse and oblique incisions in various areas of the abdomen of the dog.

It was soon apparent that the disadvantages outweighed the advantages in both transverse and oblique incisions. Longitudinal incisions in various locations were studied but none was superior to the median incision.

The illustrations in this work are particularly fine. The text matter may be even better, but, written in the Portuguese language it is a hidden text to this reviewer.